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Azelton et al.

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(54) **DISPENSING CLOSURE WITH PLUG SEALING AND LOCKING LUG**

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(51) **Int. Cl.**

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B65D 25/48	(2006.01)
B65D 41/04	(2006.01)
B65D 41/26	(2006.01)
B65D 47/06	(2006.01)
B65D 47/40	(2006.01)

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CPC ***B65D 25/48*** (2013.01); ***B65D 1/0246*** (2013.01); ***B65D 41/0428*** (2013.01); ***B65D 41/26*** (2013.01); ***B65D 47/06*** (2013.01); ***B65D 47/40*** (2013.01); ***B65D 50/048*** (2013.01); *B65D 2203/04* (2013.01); *B65D 2251/0015* (2013.01); *B65D 2251/0025* (2013.01)

(58) **Field of Classification Search**
CPC .. B65D 25/48; B65D 1/0246; B65D 41/0428; B65D 41/26; B65D 47/06; B65D 47/40; B65D 2251/0015; B65D 2251/0025; B65D 2203/04; B65D 50/048
See application file for complete search history.

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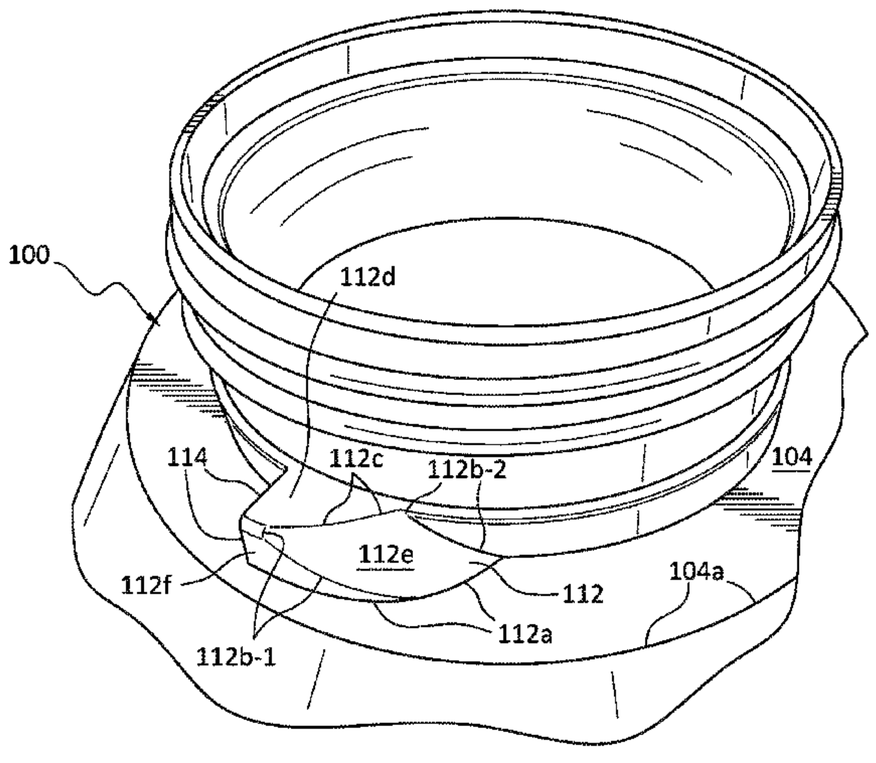
(57) **ABSTRACT**

A closure for a bottle includes an upper portion, a lower portion attached to the upper portion and including a flange extending inwardly from an interior wall of the lower portion, and the flange resides entirely within the lower portion. The closure further includes one or more grip elements located on an outer surface of the lower portion, and an annular sleeve disposed in the lower portion and including a set of interior threads.

16 Claims, 21 Drawing Sheets



(51) **Int. Cl.**
B65D 50/00 (2006.01)
B65D 50/04 (2006.01)

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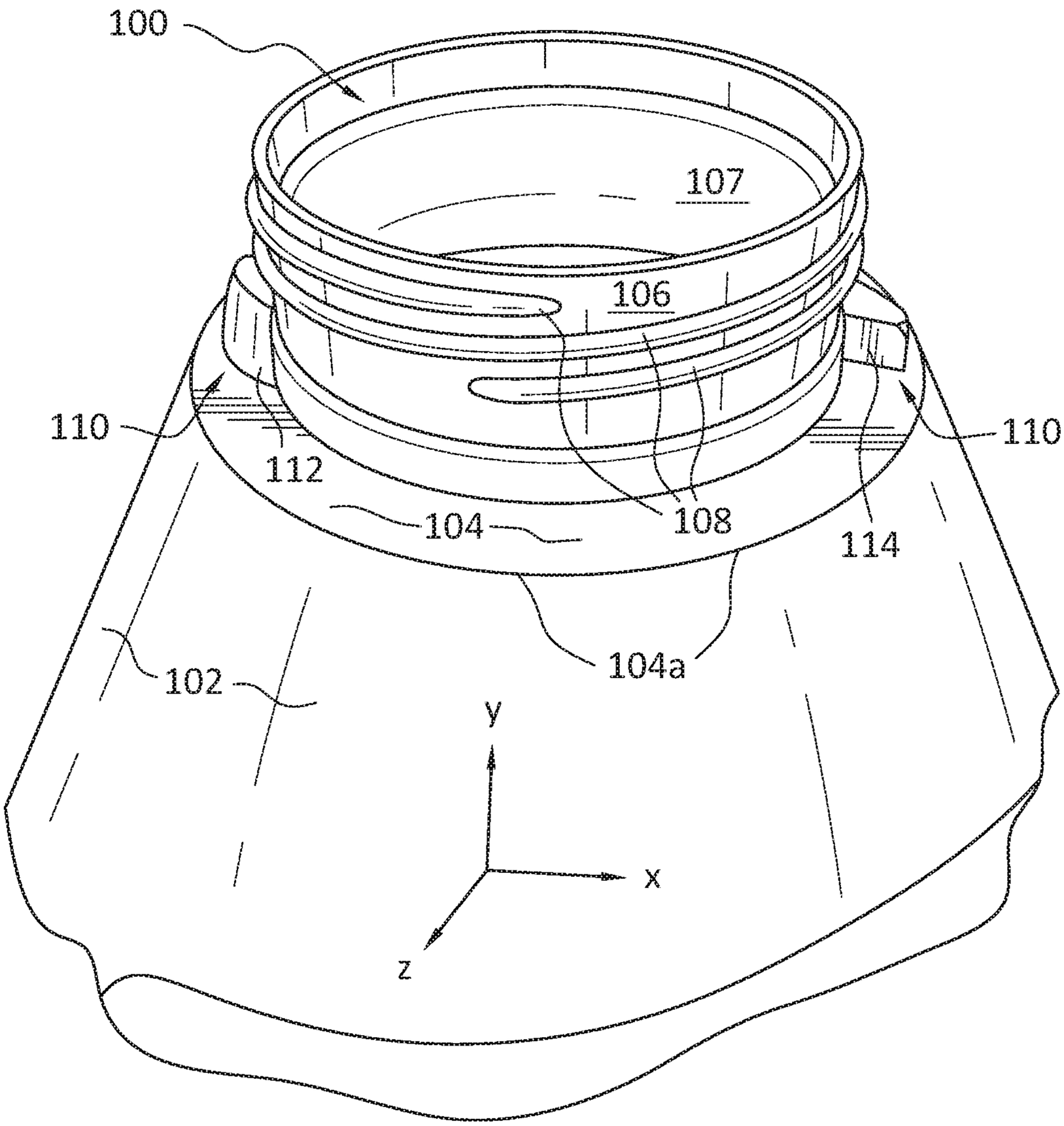


FIG. 1

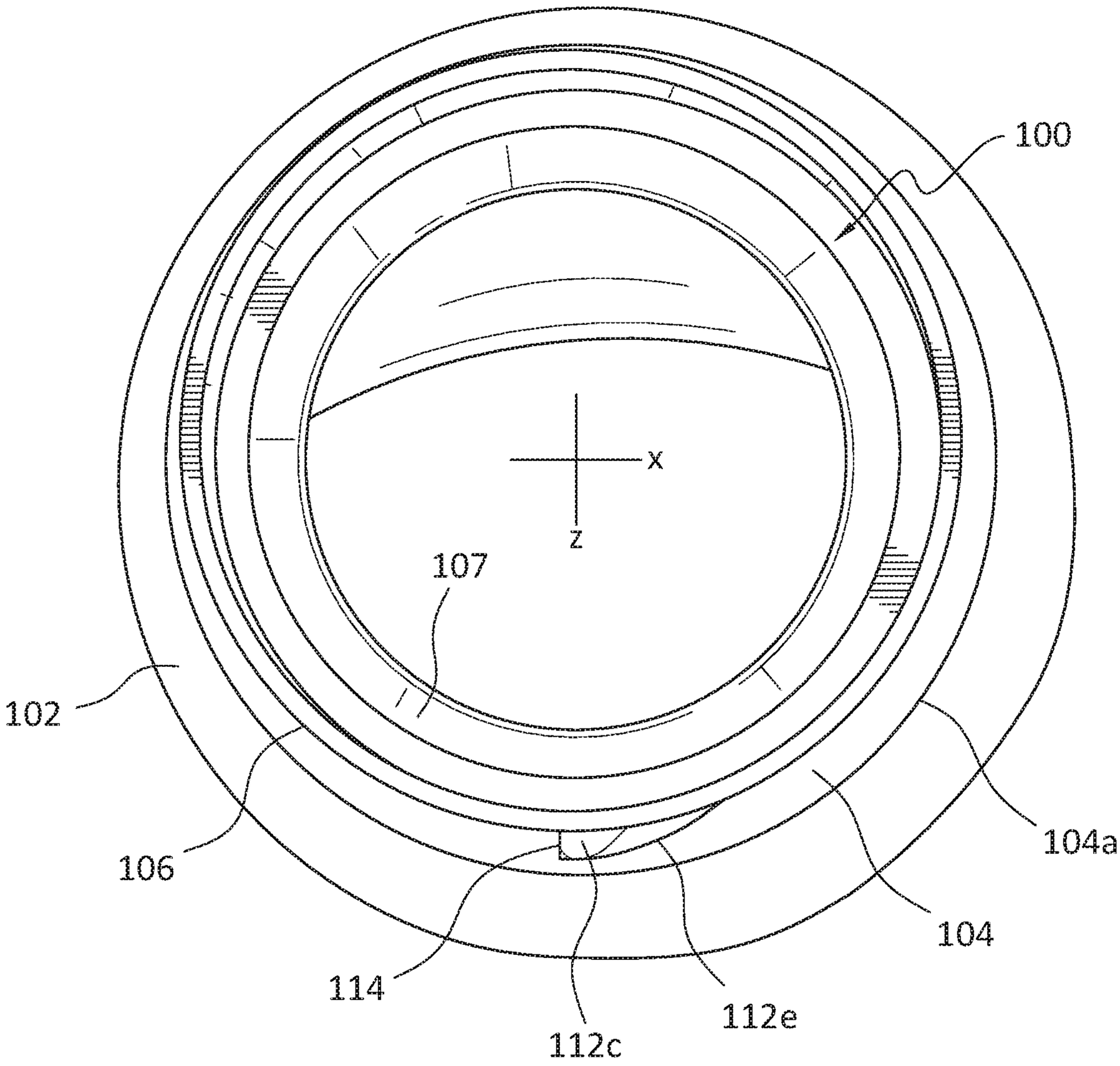


FIG. 2

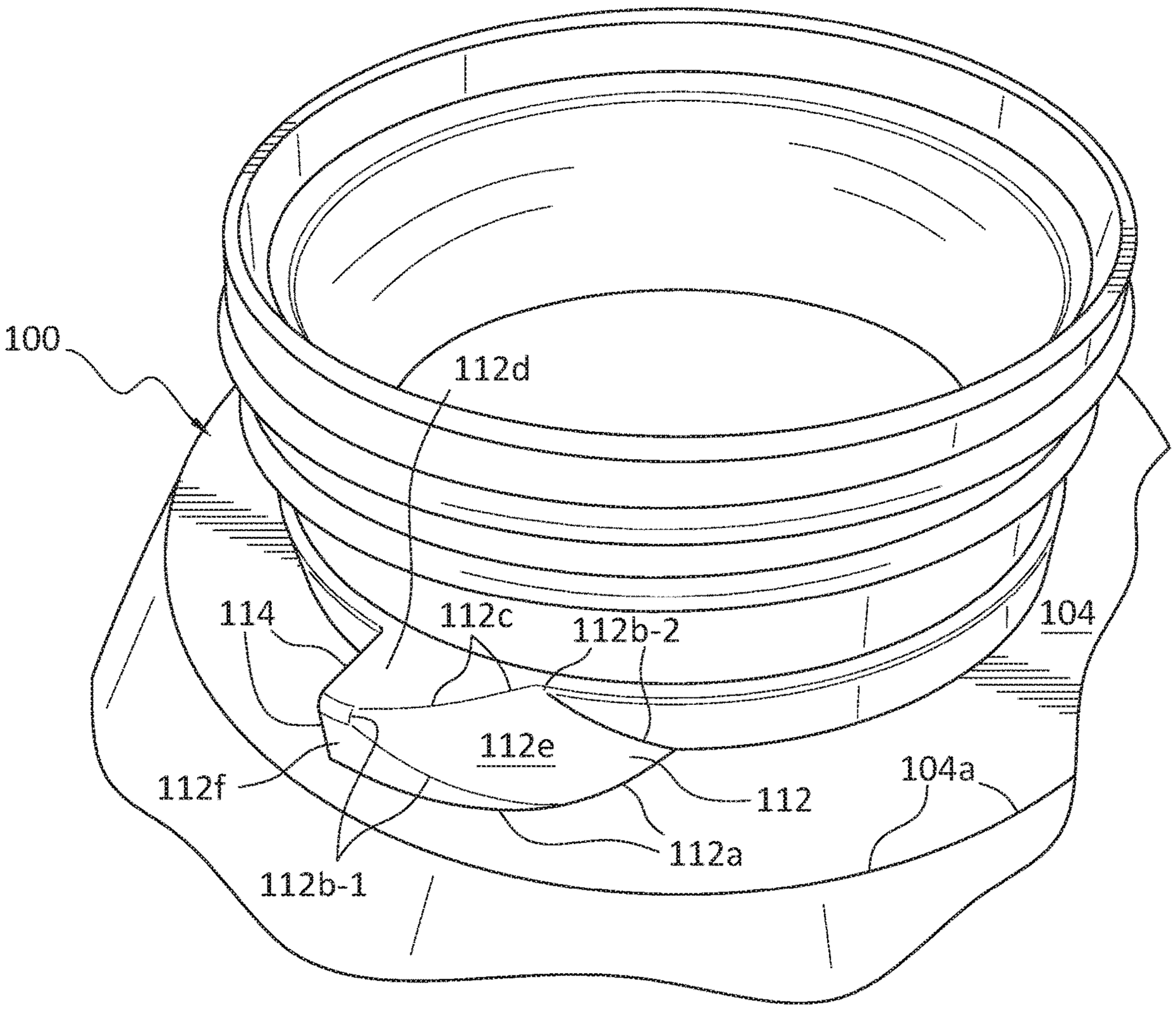
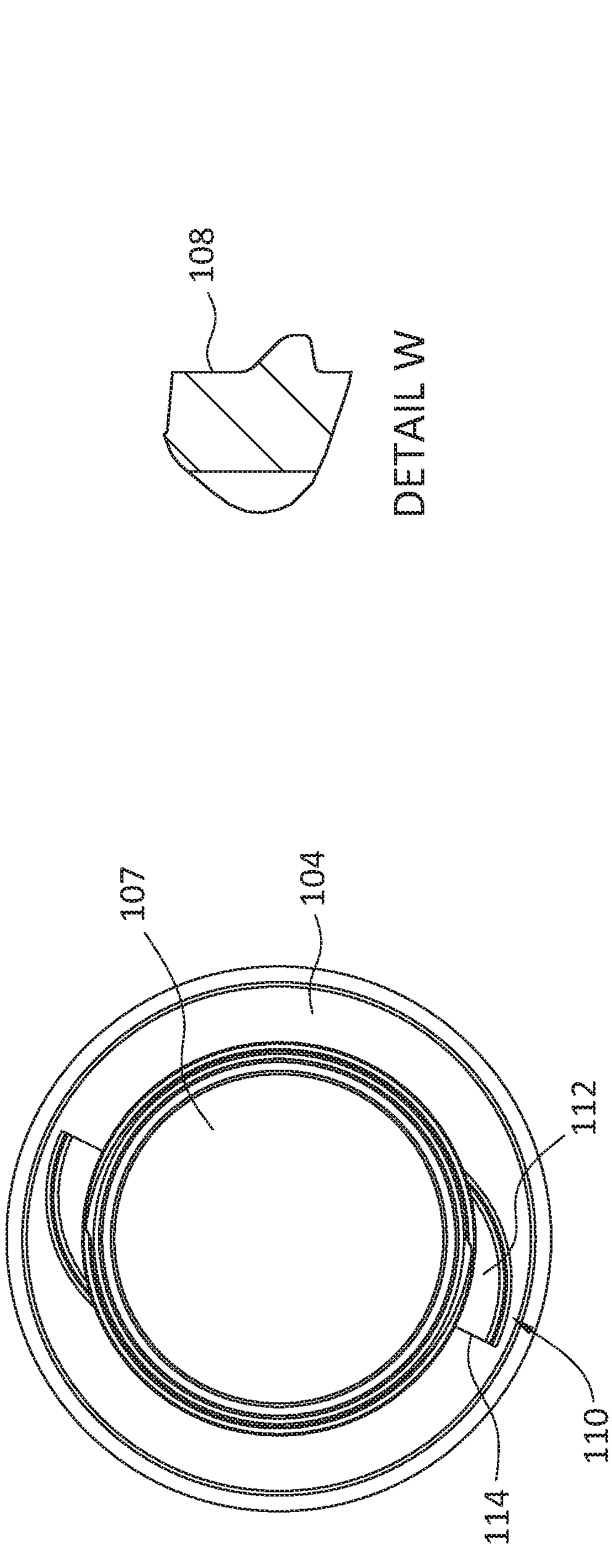


FIG. 3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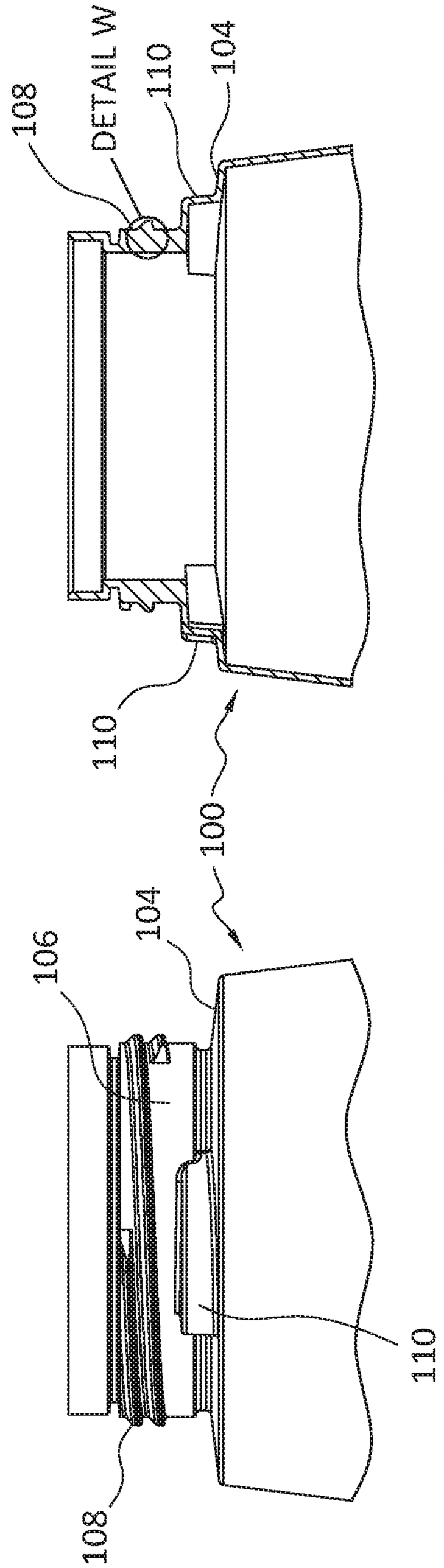
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FIG. 3A

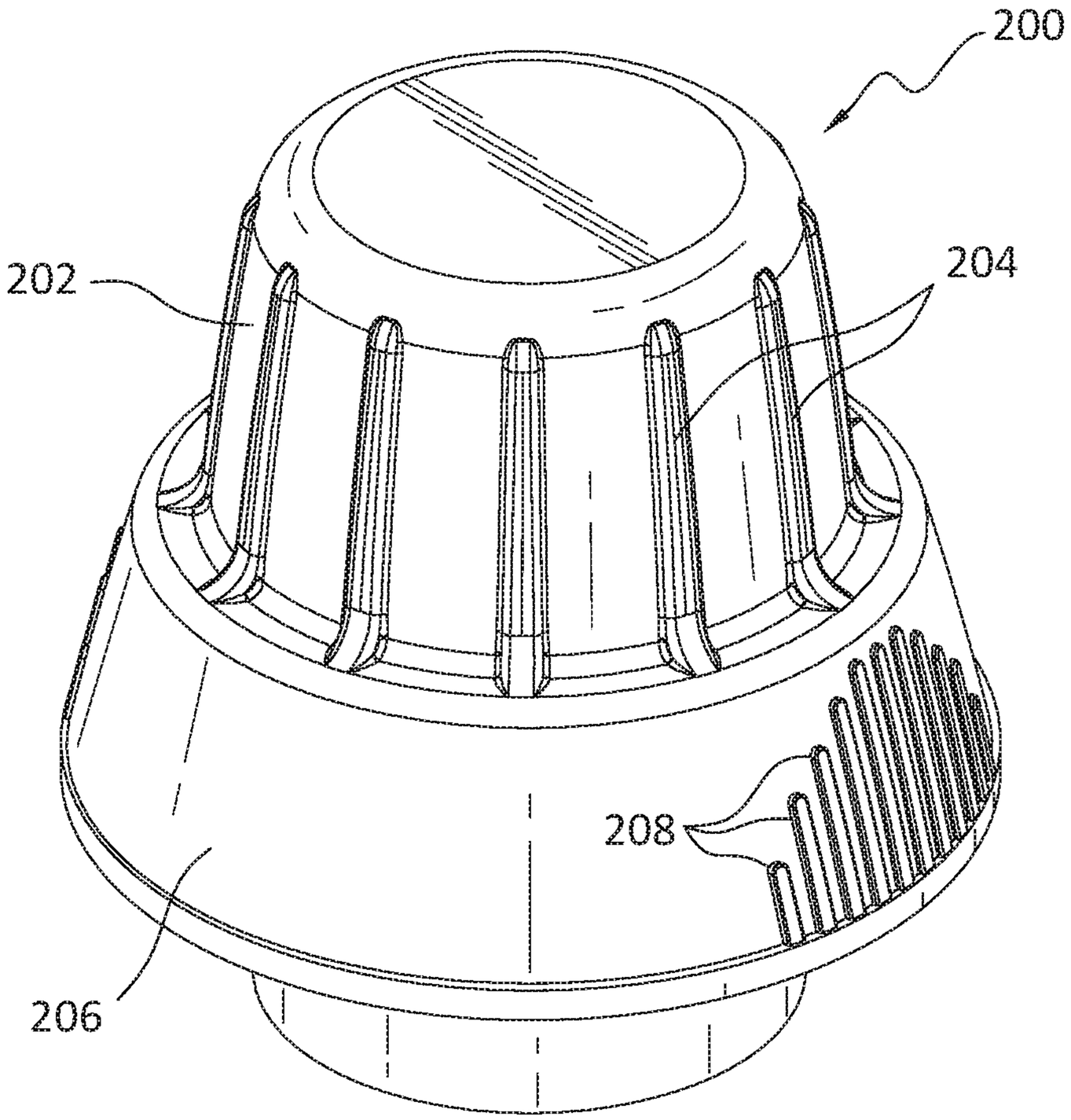

FIG. 4

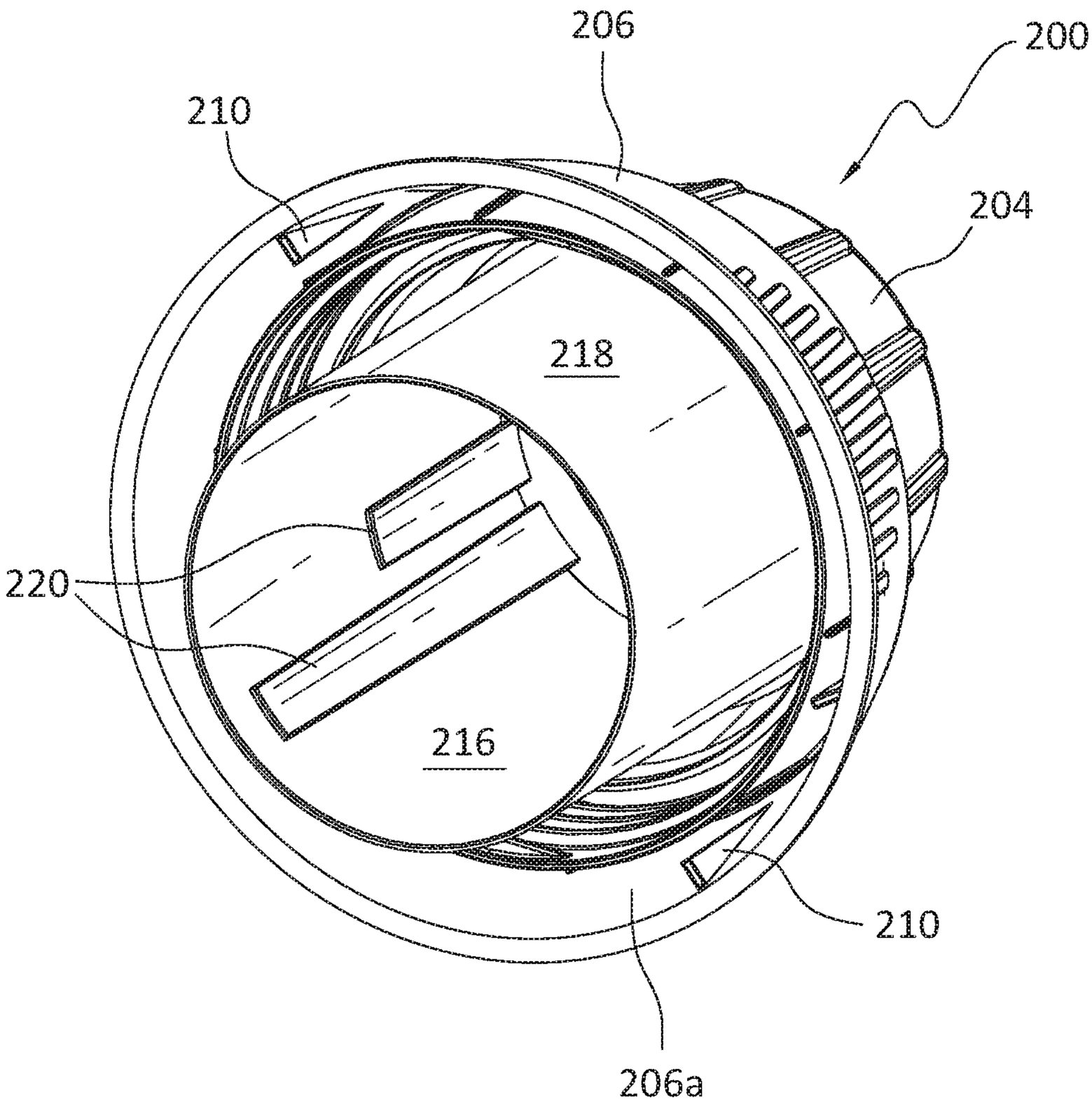

FIG. 5

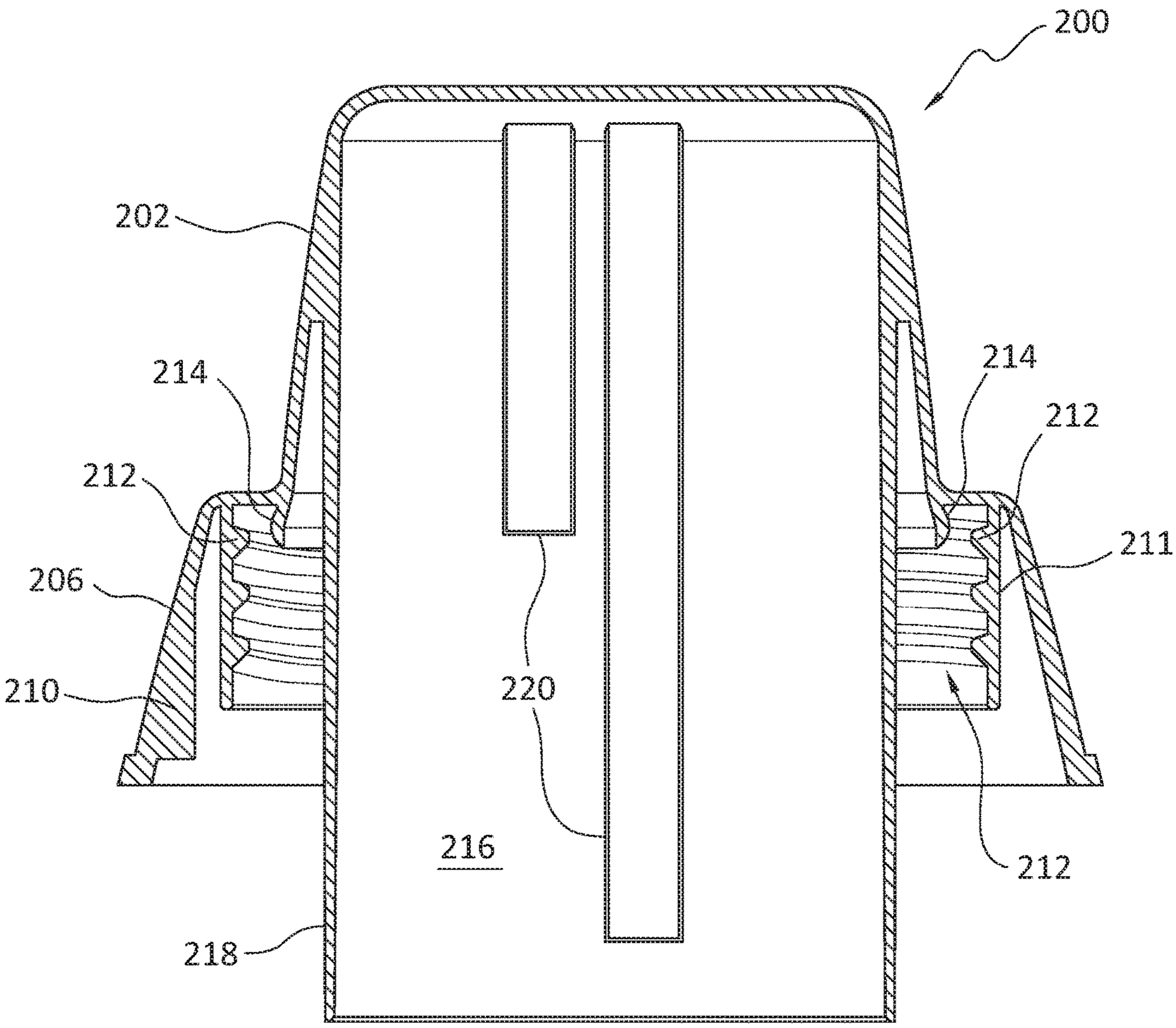

FIG. 6

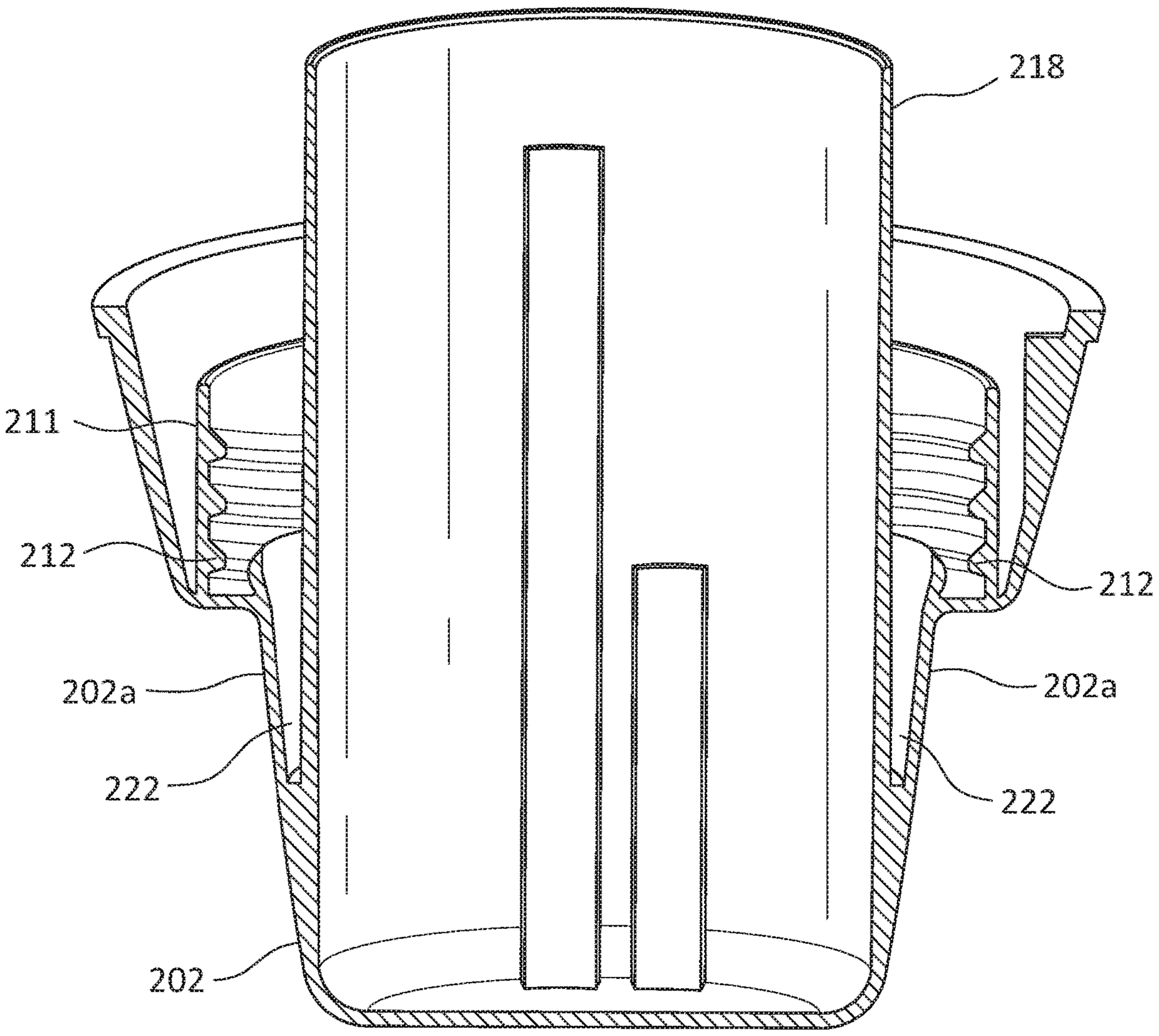

FIG. 7

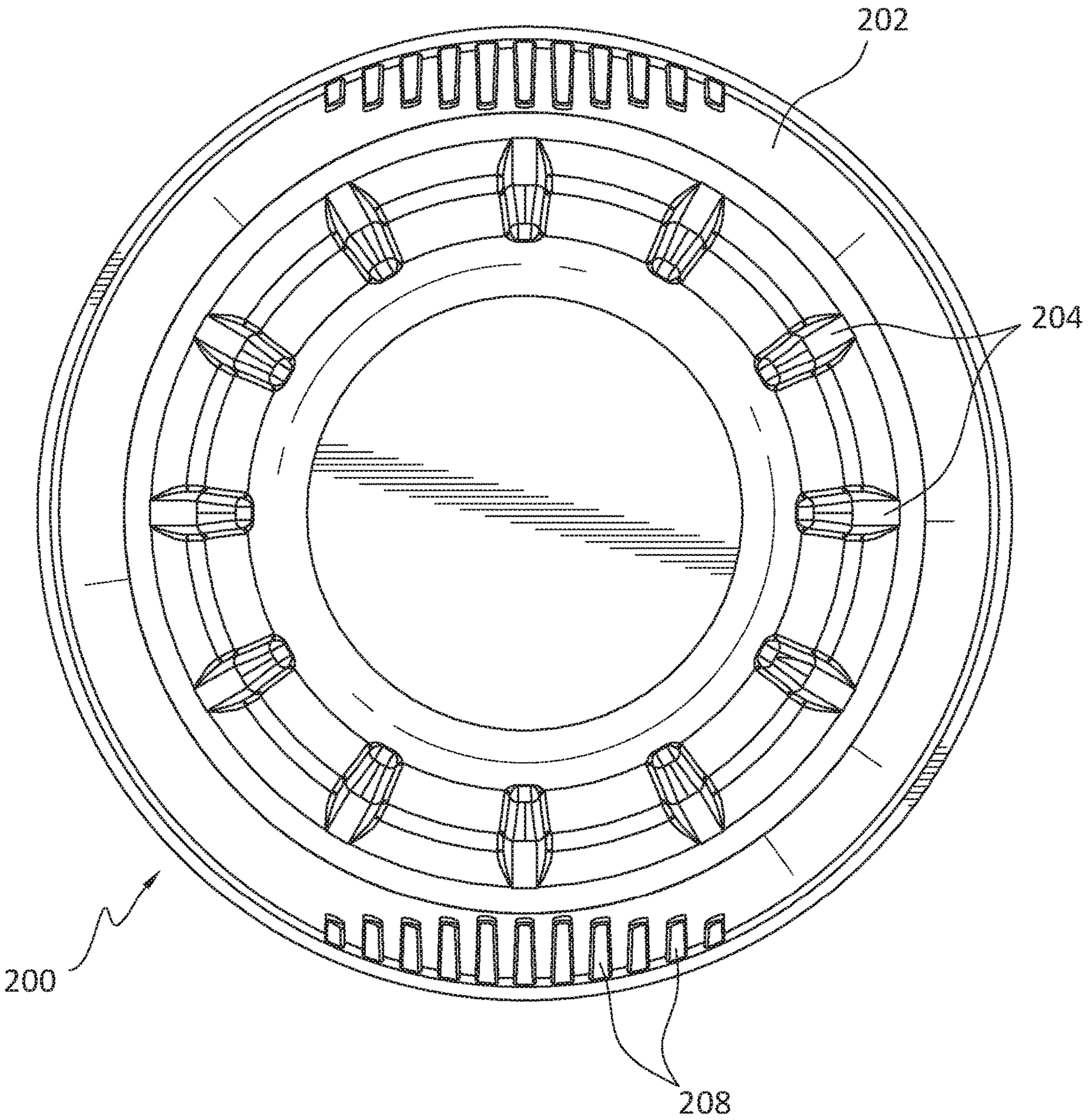

FIG. 8

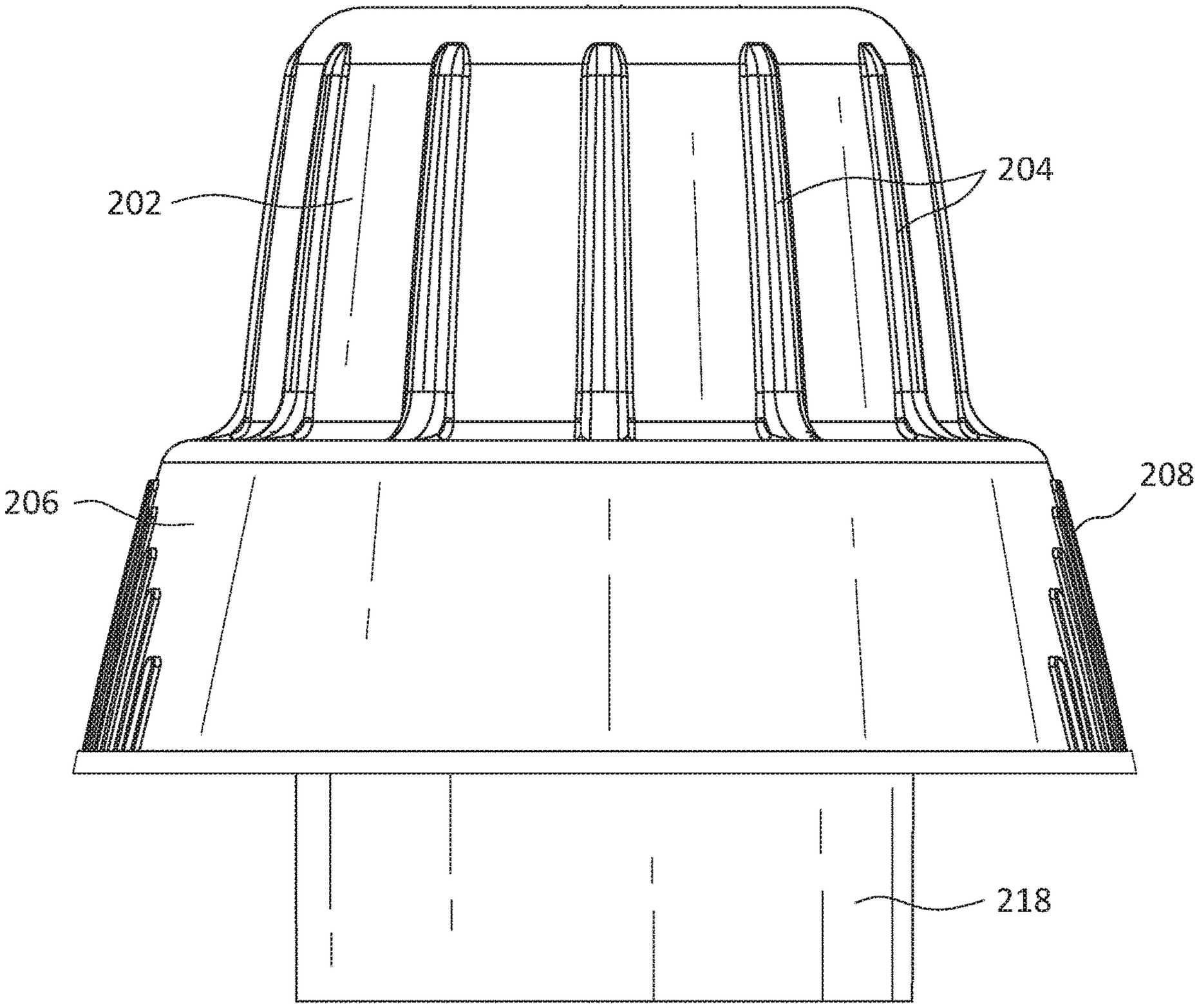

FIG. 9

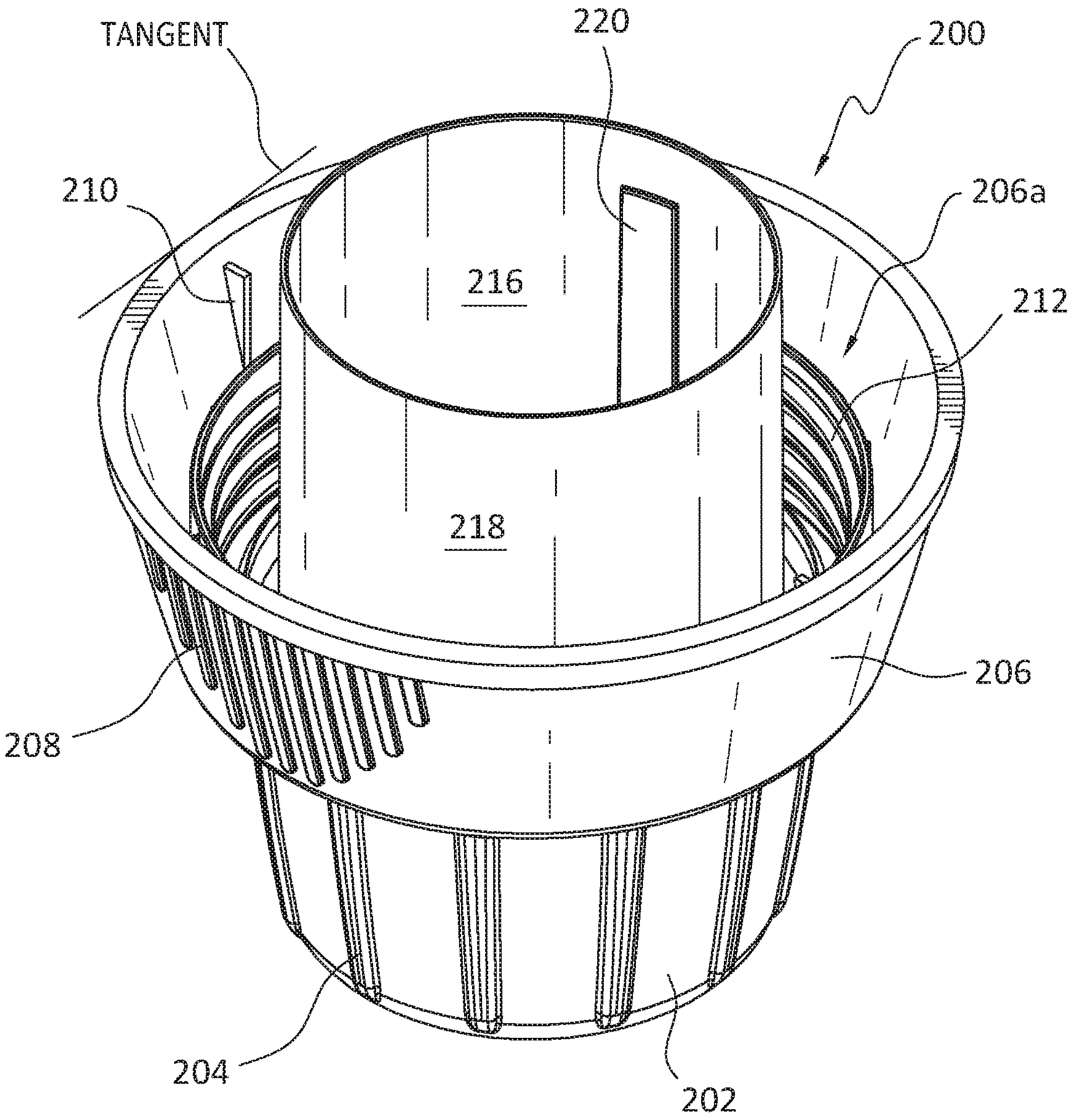

FIG. 10

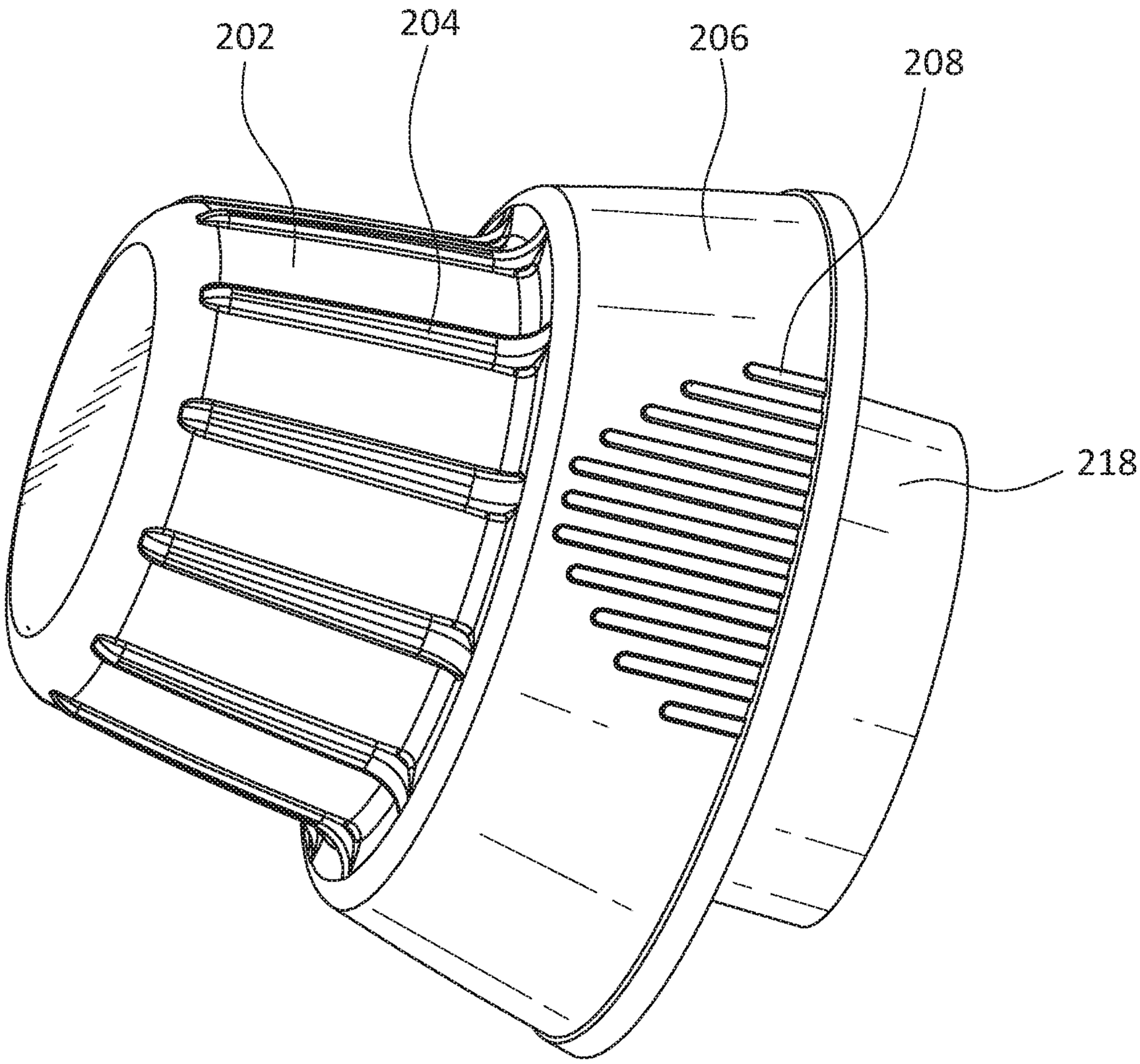

FIG. 11

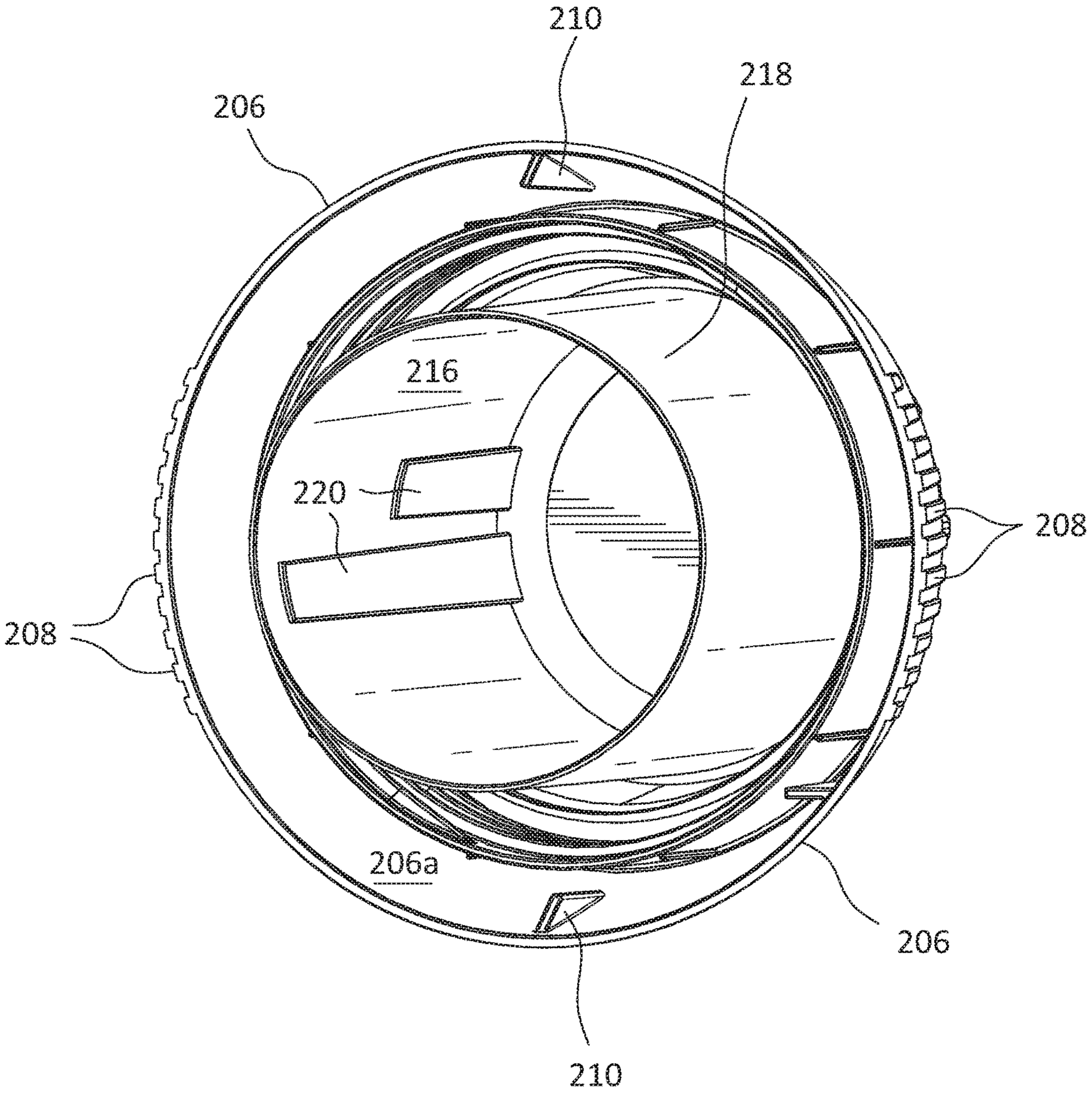

FIG. 12

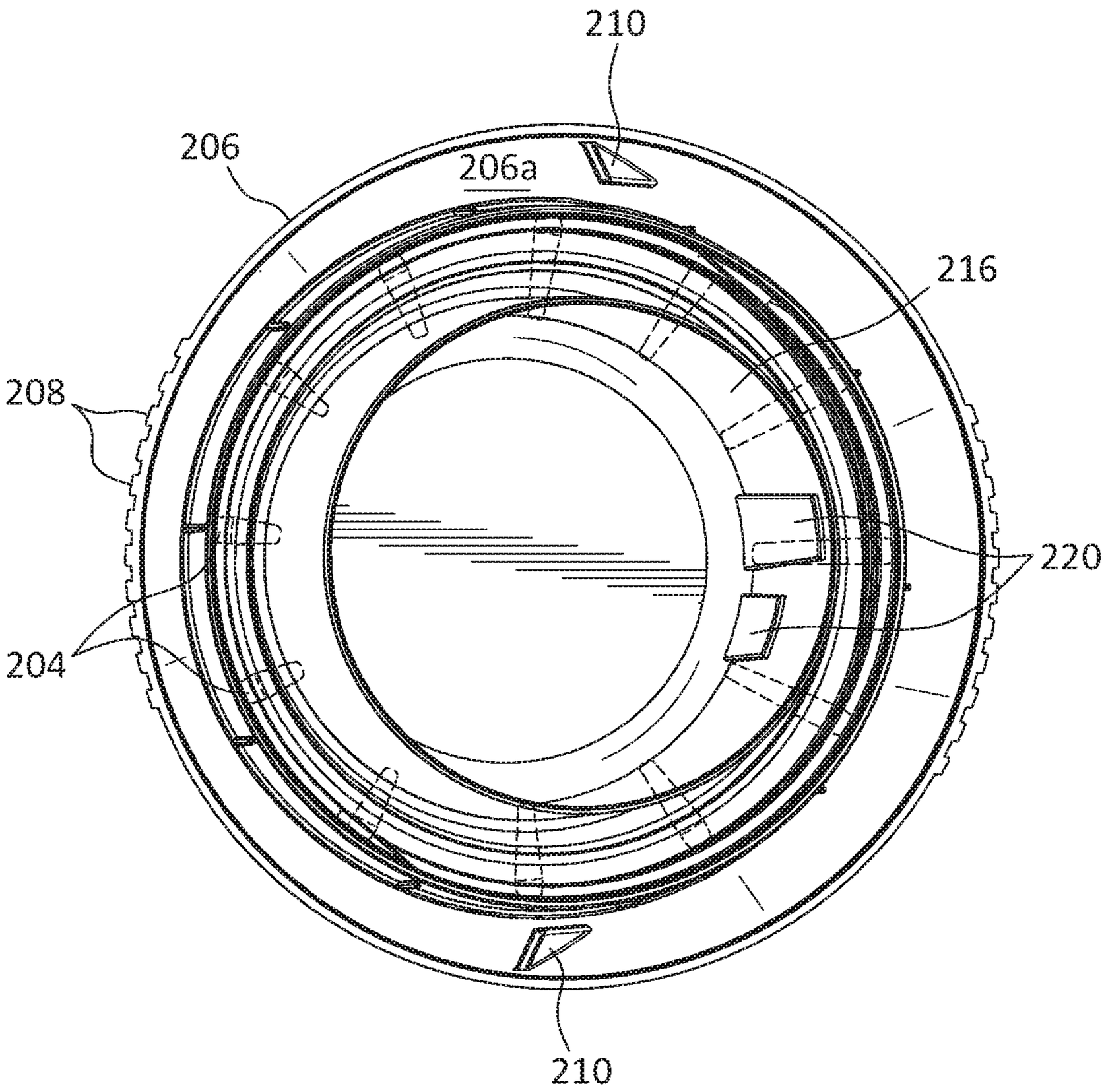

FIG. 13

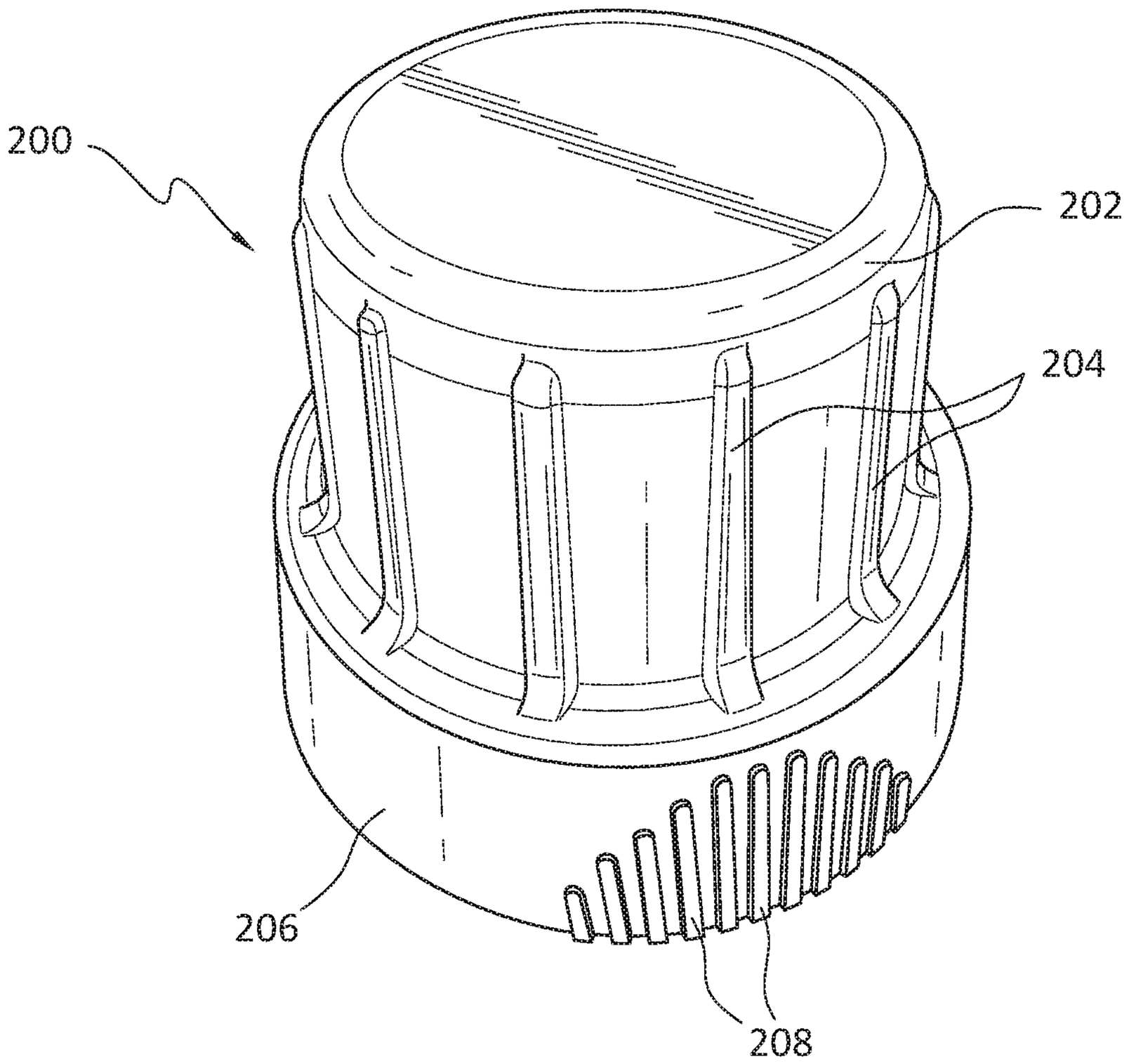

FIG. 14

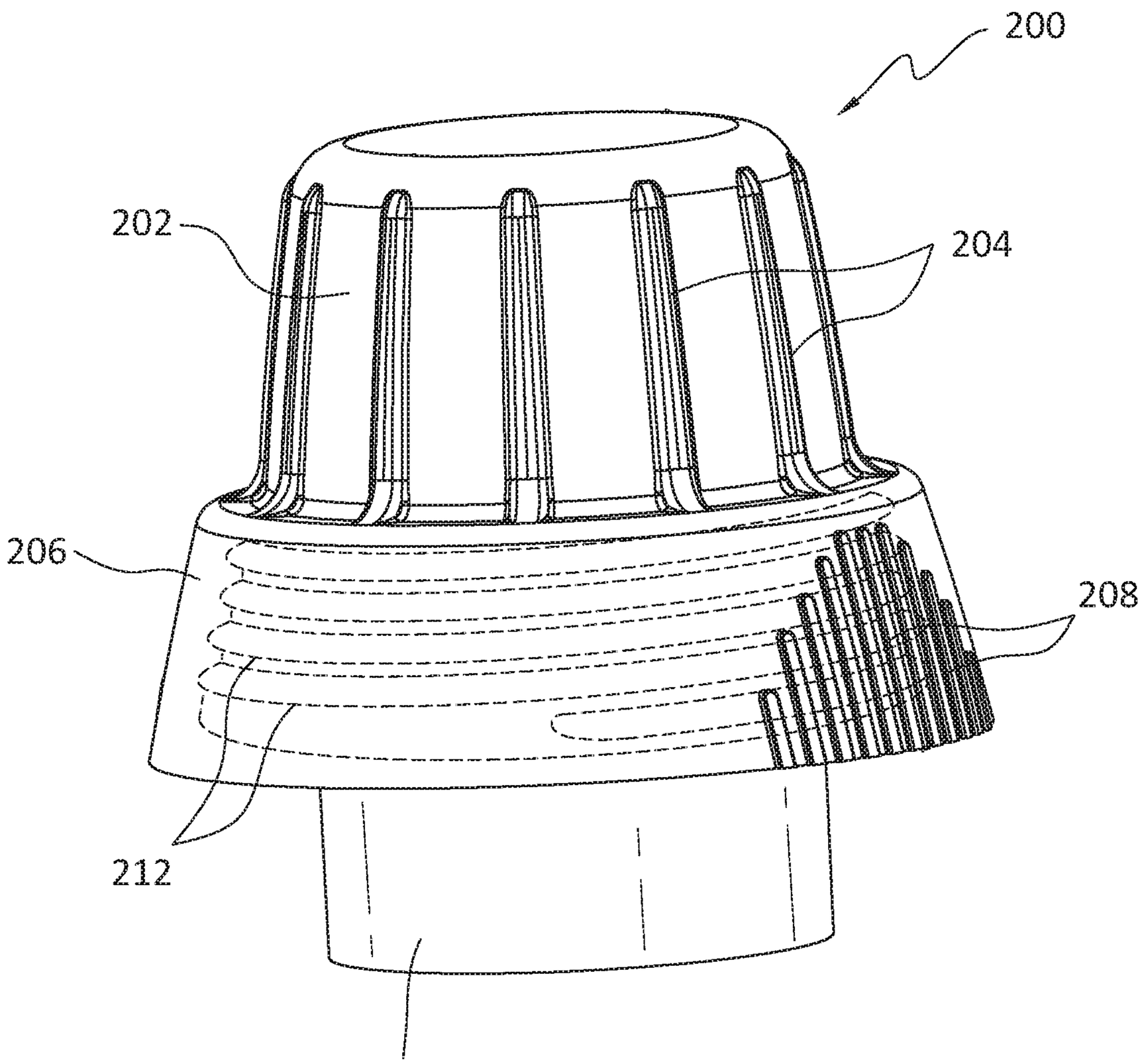

FIG. 15

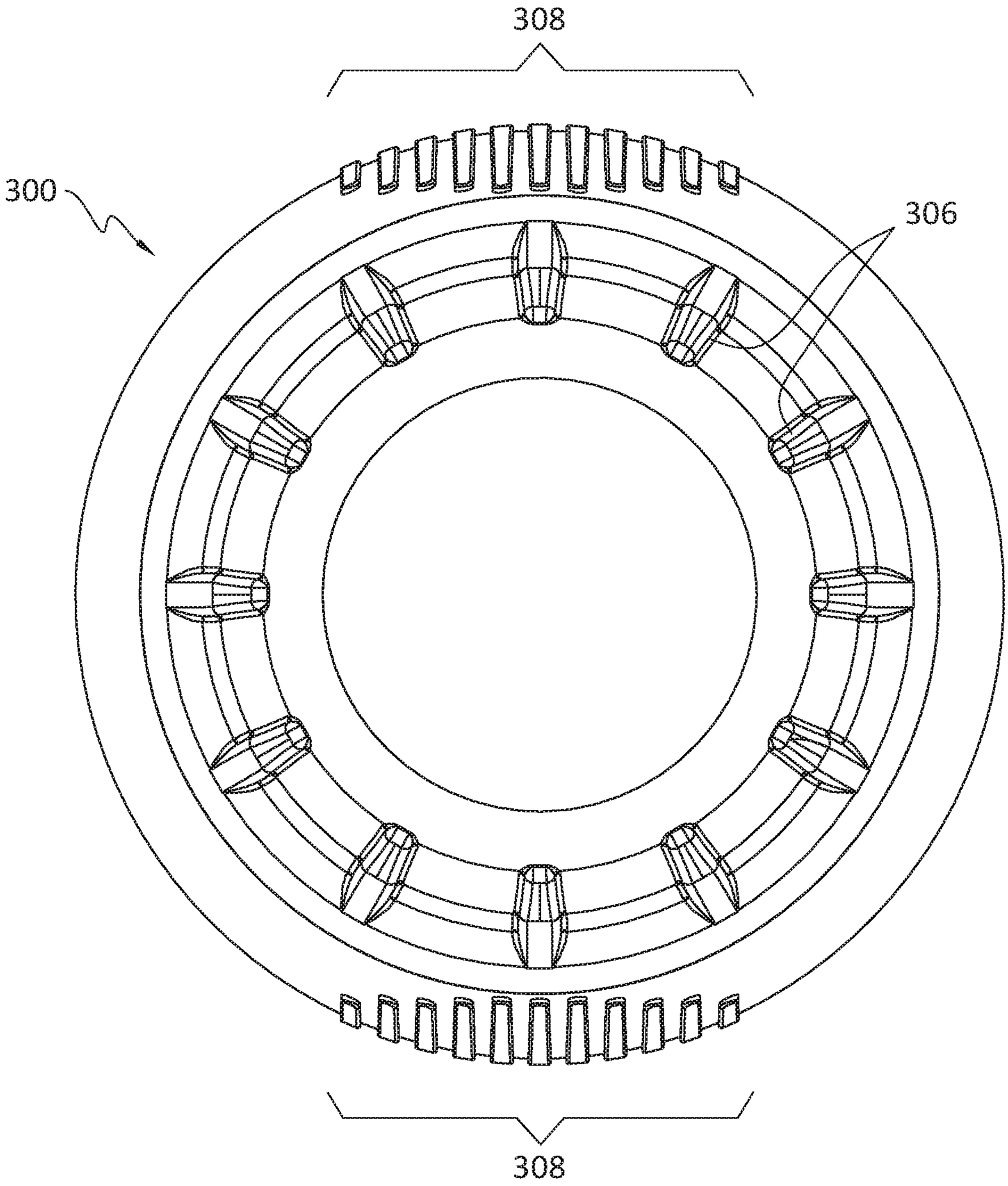

FIG. 16

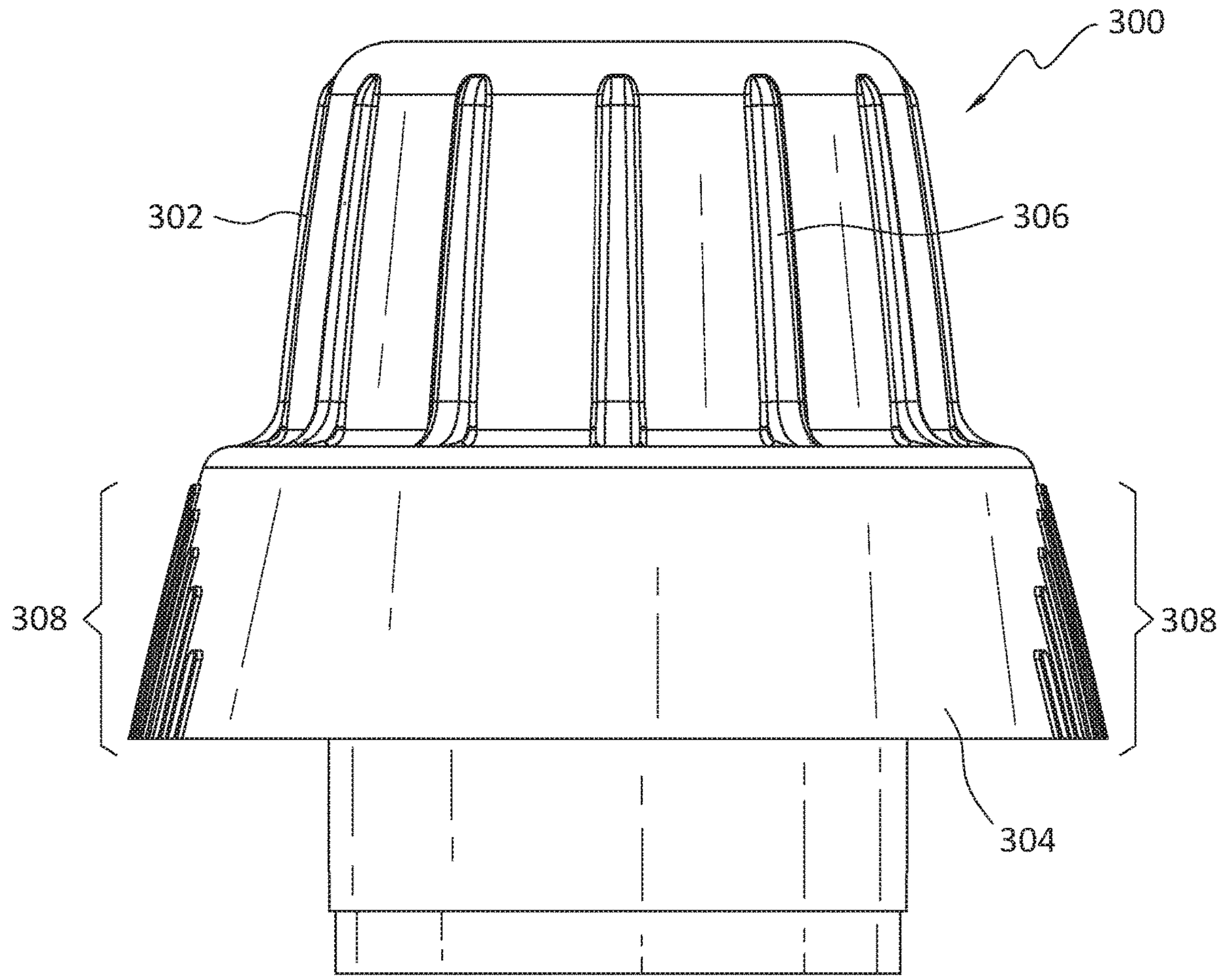

FIG. 17

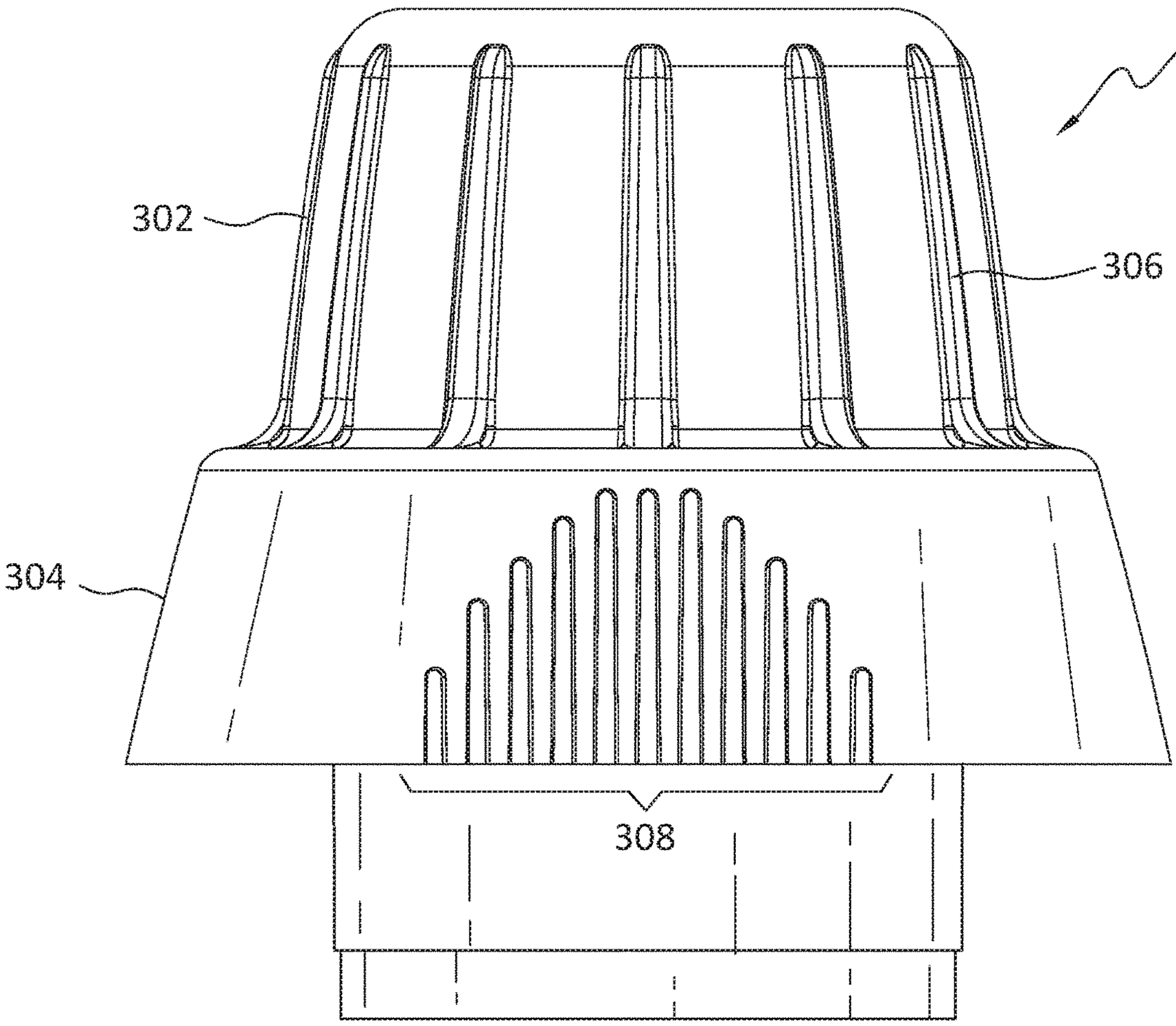

FIG. 18

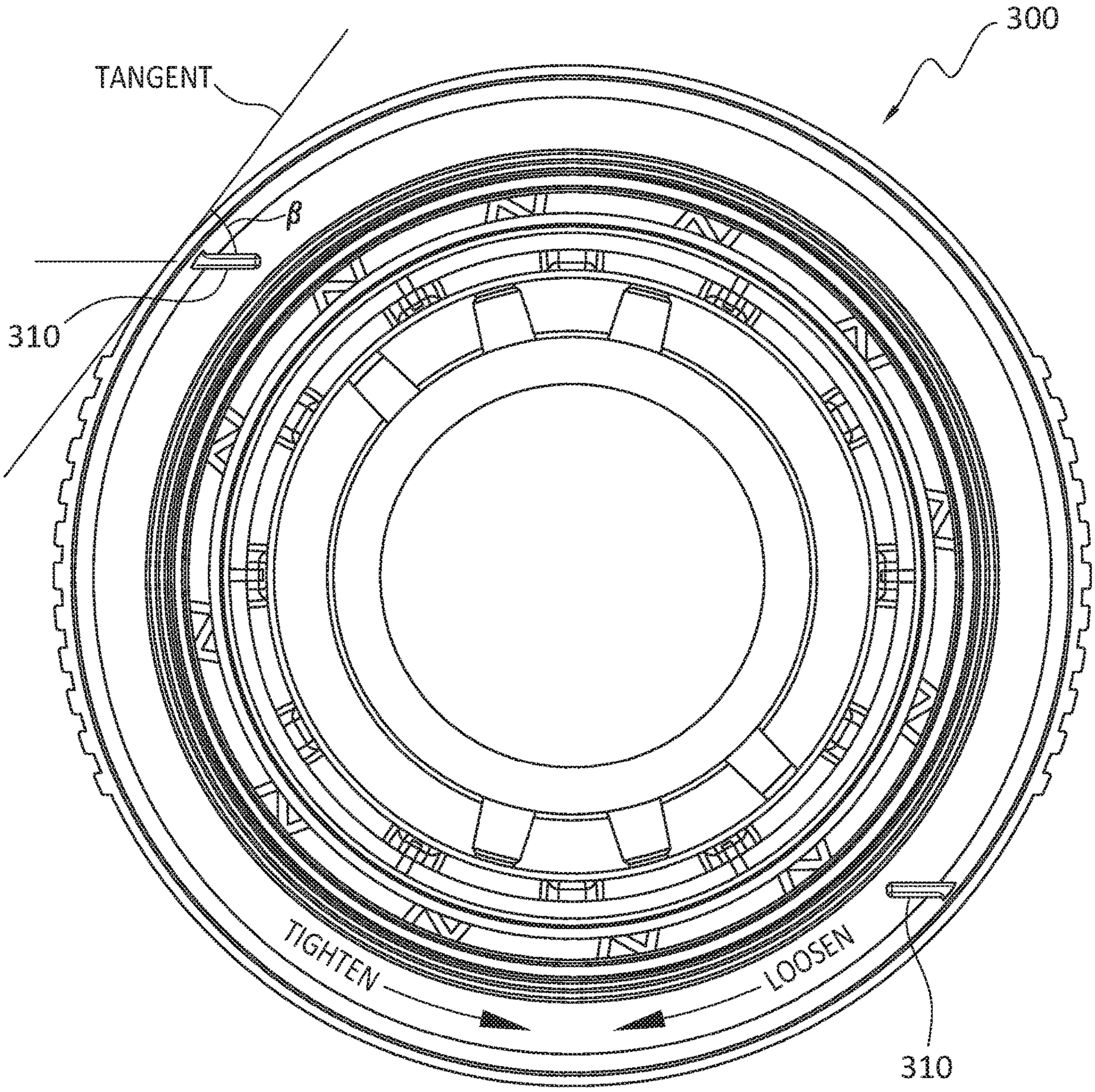

FIG. 19

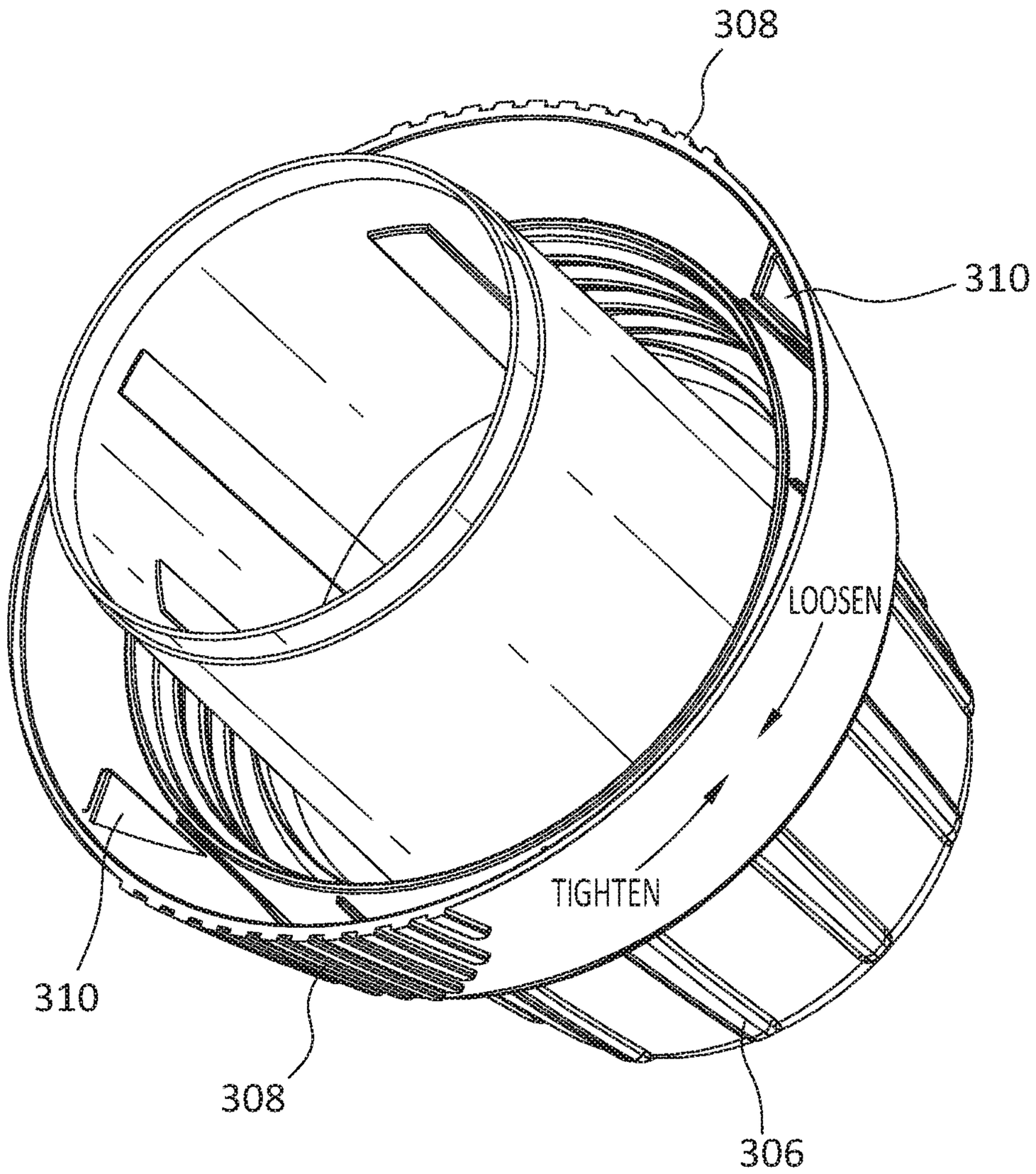

FIG. 20

DISPENSING CLOSURE WITH PLUG SEALING AND LOCKING LUG

CROSS-REFERENCE

This application claims the benefit of and priority to U.S. Provisional Application No. 62/880,283, filed Jul. 30, 2019. The disclosure is herein incorporated by reference in its entirety.

FIELD OF THE INVENTION

Embodiments of the present invention generally concern bottles that may be used to hold a variety of materials. More particularly, some example embodiments of the invention relate to a dispensing closure with plug sealing and locking lugs, and associated bottle. Other example embodiments concern a child resistant closure.

BACKGROUND

A variety of bottles exist that hold materials, such as liquid or powder laundry detergent for example, that would be harmful if ingested. This is of particular concern with respect to children, as they may not appreciate the danger presented by ingestion.

While various child resistant closures are known to exist, they are typically relatively small in size. Some examples of such child resistant closures include those found on a cough syrup bottle, or aspirin bottle. Because these child resistant closures are relatively small and could be grasped by the smaller hand of a child, it is possible that, in some instances, a child could accidentally defeat the child resistant feature of such a closure and thereby gain access to the contents of the bottle.

A related consideration regarding known child resistant closures is that their small size and/or their configuration typically renders them ineffective for dosing. Consequently, it is often the case that a separate dosing cup must be provided. This additional cup increases the cost of the product, as well as the associated waste.

Where a dosing cup is provided, it commonly occurs that the consumer overfills the dosing cup. As a result, product is spilled and wasted.

In light of considerations such as those noted above, it would be useful to provide one or more closures, and/or an associated bottle, that are effective in resolving one or more of the problems identified.

ASPECTS OF AN EXAMPLE EMBODIMENT

Embodiments within the scope of the invention may be effective in overcoming one or more of the problems in the art, although it is not required that any embodiment resolve any particular problem(s). In general, embodiments of the present invention concern bottles that include a removable closure and may be used to hold a variety of different types and forms of materials, examples of which include, but are not limited to, liquids such as liquid laundry detergents.

Some embodiments of the bottle may include one or more lugs that interfere with corresponding flanges of a closure in such a way that the closure cannot be rotated and removed from the bottle unless the flanges are deflected to a sufficient extent. In some embodiments, the portion of the closure that includes the flanges may be sufficiently stiff and large in diameter that the relatively small hand of a child would not be big enough to grip, nor strong enough to effectively

squeeze, the closure. Depending upon the embodiment, ribs and/or other structural features to increase stiffness or pliability of the closure may be added to provide desired functionality. Embodiments in which the flange(s) of a closure interact with the lugs of a bottle neck finish may be referred to herein constituting, or comprising, an anti-rotation feature and/or a child resistant feature. In some embodiments, the lug/flange system may act to halt the closure from unscrewing from the bottle, such as during transportation of the bottle to which the closure is connected. In some embodiments, the lug/flange system may prevent opening of the bottle or container unless or until the flange(s) are deflected a sufficient distance from the lugs that the closure can be rotated off the container. Such embodiments may be referred to as implementing a 'child resistant' feature.

In general then, the present disclosure embraces, among other things, two different closure/bottle configurations. The bottle geometry may, or may not, be the same for both closure/bottle configurations.

A first one of the closure/bottle configurations may comprise lugs on the bottle that interact with flanges of the closure. This general flange/lug configuration may be implemented in various ways. For example, when the flanges are located approximately opposite the grip elements of the closure (see, e.g., FIG. **5**) or within about 35 degrees to about 55 degrees away from the grip elements of the closure, such that the closure must be squeezed at/near the grip elements in order to eliminate material interference between the flanges and lugs, such a configuration may be referred to as a child-resistant (CR) configuration since the closure cannot be removed from the bottle by a child due to the interference between the flanges/lugs, and due to the manipulation of the closure that is required to overcome that interference and remove the closure from the bottle. Thus, this configuration may implement both an anti-backoff feature, and a child resistant feature that may be enabled by relatively close proximity of the flanges to grip elements on the closure.

A second one of the closure/bottle configurations may omit the lugs from the bottle, while retaining the flanges in the closure. This configuration may, or may not, be child resistant, but the presence of the flanges and their contact with the bottle structure may nonetheless provide an anti-rotation, or anti-backoff, feature, that may prevent the closure from inadvertently coming off the bottle, such as when the bottle is being transported, for example.

In more detail, in one example embodiment, a child resistant closure may have a maximum outside diameter of about 60 mm, although the scope of the invention is not limited to any particular outside diameter for the closure. The closure is threaded internally and uses a squeeze and turn motion to be engaged with, and disengaged from, corresponding external threads of the bottle.

The child resistant feature comprises one or more lugs on the bottle side that are in a selective interference relationship with a respective corresponding flange on the closure side. When the closure is squeezed at the correct point, and with adequate force, the flanges in the closure are deflected away from the lugs, thereby eliminating the interference, and the closure can then be unthreaded from the bottle. In some embodiments, the closure can be removed from the bottle even if the flanges are still in contact with the lugs, so long as that contact is not substantial, that is, so long as the interference between the lugs and flanges is insubstantial. Thus, the lug, or lugs, would only fail to interfere with the flanges when the closure is squeezed and the flanges deflected away from the lugs.

In some embodiments, the closure is also configured to serve as a dosing cup, although this is not required. For example, the dosing cup includes a central cavity into which liquid from the bottle may be poured. There is a space defined by the intersection of the central cavity wall and outer wall that creates an overflow reservoir. In the event the consumer overfills the cup, liquid can be captured in this volume and then returned to the bottle without contacting the threads inside the cap and causing liquid to drip on the exterior surface of the bottle. In some embodiments, the overflow reservoir may be omitted.

To attach the closure to the bottle, the user can grasp the closure and simply rotate the closure until it is fully seated on the bottle. Threads inside the closure mate with threads on the exterior of the bottle to aid in attachment and removal of the closure, and to help retain the closure on the bottle. As the closure is rotated clockwise to the closed position, a flange of the closure passes over a ramp portion of a lug on the bottle and moves into a position, which may be referred to herein as an interference position, opposite an upstanding wall near the end of the ramp. This movement of the flange may involve some elastic deformation of the flange. When the flange is thus positioned, the upstanding wall prevents counterclockwise motion of the flange, and the closure is thus locked to the bottle.

To remove the closure, the user can grasp and squeeze the closure, thereby elastically deflecting the flange to a position and orientation where the upstanding wall of the lug no longer materially impairs a change in position of the flange. This position may be referred to herein as a non-interference position but, as noted, even in the non-interference position, there may be some insubstantial contact between the flange and the lug. When the flange is in the non-interference position, the closure can then be rotated relative to, and removed from, the bottle. In at least some embodiments, there is no need to continue to squeeze the closure once the deflected flange has been moved past the nearest lug.

Advantageously then, example embodiments of the invention are directed to a bottle and closure that may serve to prevent a child from accessing the contents of the bottle. Embodiments of the invention may, or may not, include an overflow reservoir. Some embodiments may be configured such that the cap is prevented from inadvertently backing off of the bottle and becoming partly, or completely, disengaged from the bottle. This configuration and functionality may be useful, for example, when the bottle is being transported, since there may be some assurance that no leakage will occur even while the bottle is being moved and reoriented. Example embodiments of the invention include a closure that may be provided with an overflow reservoir configured and arranged to prevent liquid contents from flowing onto the threads of the closure and, thus, to the exterior of the bottle when the closure is placed on the bottle. Embodiments of the closure may include a relatively large central cavity so as to enable use of the closure as a dosing cup.

Some example embodiments of the invention may be used in connection with detergent, which may be in a loose granular form, or in a liquid form. Any other powders, liquids, or granular materials, in whatever form, may also be used. Yet other embodiments of the invention may be employed with liquids, dry materials, pastes and gels, for example.

BRIEF DESCRIPTION OF THE DRAWINGS

In order to describe the manner in which at least some aspects of this disclosure can be obtained, a more particular description will be rendered by reference to specific embodiments thereof which are illustrated in the appended drawings. Understanding that these drawings depict only example embodiments of the invention and are not therefore to be considered to be limiting of its scope, embodiments of the invention will be described and explained with additional specificity and detail through the use of the accompanying drawings.

FIGS. **1-3**, and **3***a*, are perspective views of a bottle according to various example embodiments of the invention.

FIG. **4** is a side perspective view of an example closure.

FIG. **5** is a bottom perspective view of an example closure.

FIG. **6** is a section view of an example closure.

FIG. **7** is a section view of an example closure.

FIG. **8** is a top view of an example closure.

FIG. **9** is a side view of an example closure.

FIG. **10** is a bottom perspective view of an example closure

FIG. **11** is a side perspective view of an example closure.

FIG. **12** is a bottom perspective view of an example closure.

FIG. **13** is a partial bottom perspective view of an example closure.

FIG. **14** is a top perspective view of an example closure.

FIG. **15** is a side view of an example closure.

FIGS. **16-20** disclose aspects of an alternative embodiment of a closure.

DETAILED DESCRIPTION OF SOME EXAMPLE EMBODIMENTS

Reference will now be made in detail to aspects of various embodiments of the present disclosure, examples of which are illustrated in the accompanying drawings. While described in conjunction with these embodiments, it will be understood that they are not intended to limit the disclosure to these embodiments.

In general, embodiments of the invention may be employed in storing liquid and dry materials of various forms such as powders, liquids, and granular materials, for example. Some particular example embodiments of the invention may be used for the storage of laundry detergent in powder or liquid form, although the scope of the invention is not limited to any particular application or stored material. Thus, further examples of such dry materials include, but are not limited to, de-icing salts, lawn and garden chemicals such as fertilizers, and any other dry materials that may be contained by one of the disclosed embodiments. Still other particular examples of materials with which various disclosed embodiments may be employed include, but are not limited to, food, gels and paste, beverages, supplements of various types including vitamins and dietary supplements, toys (e.g., army men, LEGO® blocks and pieces, blocks, cars, beads), laundry detergent, laundry bleach, cleaning formulas, cleaning gels, dry chemicals, cleaning utensils, personal care items, shampoo & conditioner, outdoor chemicals (e.g., pool chemicals), paint, litter for pet litter boxes, pet supplements and food, pet treats, pet toys, powder mix for food and drinks, beverage powder, candy and chocolates, nuts, toy articles, medical and/or hospital kits, charcoal. Additional examples of liquids with which some embodiments of the invention may be used include, but are not limited to, cleaning agents, cleaning solutions, cleaning compositions, lawn and garden chemicals, antifreeze, window washing chemicals, windshield de-icing liquids, motor oil, and any other liquids that may be contained by one of the

disclosed embodiments. Further examples of materials that may be employed in connection with one or more of the disclosed embodiments include vitamins and medicines, whether in liquid or dry form.

More generally, and as the aforementioned examples collectively demonstrate, embodiments of the invention are not limited to use with any particular material(s). Moreover, embodiments of the invention embrace both bottles that are empty, as well as bottles that are full, or partly full, of any of the materials disclosed herein, and/or any other materials.

A. Example Bottle

Directing attention first to FIGS. **1-3***a*, details are provided concerning an example bottle. As shown in FIG. **1**, reference axes x, y, and z indicate a respective x-direction, y-direction, and z-direction. To illustrate, the y-direction corresponds to a vertical axis that is perpendicular to a horizontal x-z plane defined by the opening of the bottle. FIG. **3***a* discloses some example dimensions for the neck portion of an example embodiment of a bottle.

The illustrative example of the bottle is denoted generally at **100**. In at least some embodiments, the bottle **100** comprises, or consists of, plastic, although other materials could alternatively be used. The bottle **100** can be formed using any suitable method or process, examples of which include injection molding, blow-molding, and vacuum molding. When manufacturing processes such as these are employed, the bottle **100** can be formed of a single piece of material, although that is not necessarily required. The bottle **100** may be any shape or size and may be colored or clear, and translucent or opaque.

In general, the example bottle **100** includes an outer wall **102** that cooperates with a bottom (not shown) of the bottle **100** to define part of a volume that may hold any of the materials disclosed herein, including a liquid laundry detergent. The outer wall **102** is connected by an annular shoulder **104** to a neck **106**, both of which may be substantially circular in shape. In at least some embodiments, the body of the bottle **100** has a relatively larger outer perimeter than a perimeter of the neck **106**. The neck **106** defines a mouth **107** and may include threads **108** external to the neck **106** and configured to releasably engage corresponding threads of a mating closure, as discussed below. Any size, pitch, angle, type or arrangement of threads **108** can be used. In some particular embodiments, the threads **108** include a relatively small number of thread starts, for example, three or fewer thread starts. No particular thread size or configuration is required by any embodiment.

The example bottle **100** further includes one or more lugs **110** disposed on the annular shoulder **104**. The lugs **110** may be integral with the bottle **100**, although that is not necessarily required. Where multiple integral lugs **110** are provided, they may be spaced equidistantly about the circumference of the annular shoulder **104**, although that is not required and, in some embodiments, the integral lugs **110** are not spaced equidistantly. The integral lugs **110** may extend outwardly to, or near, an outer edge **104***a* of the annular shoulder **104**. The number, size, spacing, and orientation, of the integral lug(s) **110** may be implemented in any of a variety of ways and, as such, the configuration shown in the Figures is provided only for the purpose of illustration.

In some example embodiments, two lugs **110** may be provided that are about 180 degrees apart from each other. However, more, or fewer, lugs **110** may be employed in other embodiments. As well, the spacing between successive lugs **110** may be greater, or less than, about 180 degrees. For example, one embodiment may include three lugs **110** that are spaced about 120 degrees apart from each other. Thus, the scope of the invention is not limited to the example lug **110** configuration and arrangement disclosed in the Figures.

Each of the integral lugs **110** includes a ramp portion **112** that terminates at an upstanding wall **114**, that may be radially oriented with respect to a central vertical axis 'y' defined by the neck **106**. The ramp portion **112** is configured and arranged so that a vertical y-direction height of the ramp portion **112** increases in a clockwise direction (when the bottle **100** is viewed from the top, as shown in FIG. **2**). As further indicated in FIGS. **1-3***a*, the ramp portion **112** may include a curved bottom edge **112***a*, a curved outside edge **112***b*-**1**, a curved inside edge **112***b*-**2**, and an upper edge **112***c* that defines an intersection between an upper surface **112***d* and a face **112***e* of the ramp portion **112**. Finally, an outside upstanding wall **112***f* extends between the bottom edge **112***a* and the side edge **112***b*.

B. Example Closure

With reference now to FIGS. **4-14**, details are provided concerning a closure that can be used in conjunction with a bottle such as bottle **100**. One example of a closure is denoted in the Figures generally at **200**. In at least some embodiments, the closure **200** comprises, or consists of, plastic, although other materials could alternatively be used. The closure **200** can be formed using any suitable method or process, examples of which include injection molding, blow-molding, and vacuum molding. When manufacturing processes such as these are employed, the closure **200** can be formed of a single piece of material, although that is not necessarily required. The closure **200** can be any shape or size and may be colored or clear, and translucent or opaque.

As indicated, the closure **200** is generally circular in shape, although other shapes and configurations, such as any polygon for example, could alternatively be used. The closure **200** may be considered in terms of the size of its outside diameter. As such, example embodiments of the closure **200** may have a maximum outside diameter in a range of about 50 mm to about 70 mm, although smaller or larger closure **200** outside diameters could be used in other embodiments.

The closure **200** includes an upper portion **202**, which may have a generally conical configuration, that includes one or more upper grip elements **204**. Any number, size, shape, configuration, and orientation, of upper grip elements **204** may be used and the upper grip elements **204** may, or may not, be spaced equidistantly about the circumference of the upper portion **202**. In the illustrated example, the upper grip elements **204** take the form of ribs that are spaced generally equidistantly about the circumference of the upper portion **202**.

In one embodiment, the outside diameter at, or near, the top of the upper portion **202** may be about 45.47 mm without taking into account the upper grip elements **204**. When the upper grip elements are taken into consideration, the outside diameter at, or near, the top of the upper portion **202** may be about 47.29 mm. These dimensions are provided only by way of example, and are not intended to limit the scope of the invention. Larger, and smaller, outside diameters of the top of the upper portion **202** may be employed in other embodiments.

As indicated in the Figures, the example closure **200** further includes a lower portion **206** that may be flared outwardly and is connected to the upper portion **202**. The lower portion **206** may include one or more grip elements

208. As best shown in FIG. 8, there may be two, or more, sets of grip elements 208 that may, or may not, be spaced about equidistantly about the circumference of the lower portion 206. In one example embodiment, two sets of grip elements 208 are provided that are located about 180 degrees apart from each other.

With particular reference now to FIGS. 5-7, the lower portion 206 includes, on its interior wall 206*a*, one or more inwardly extending flanges 210. As indicated, the flanges 210 may reside entirely within the closure 200 and, particularly, entirely within the lower portion 206. As such, the flanges 210 may not be visible when the closure 200 is locked to the bottle 100, particularly when the closure 200 is opaque.

In some embodiments, and shown in FIG. 5 in particular, the flanges 210 may each be disposed about 90 degrees away from one or more sets of grip elements 208. In one particular embodiment, one or more flanges 210 are disposed between about 40 degrees and about 50 degrees away from the grip elements 208. In another particular embodiment, one or more flanges are disposed about 45 degrees away from the grip elements 208. In some embodiments, one or more flanges may be positioned, relative to the grip elements 208, such that maximum deflection of the flange 210 may be achieved when the grip elements 208 are squeezed. In some particular embodiments, the flange 210 location corresponding to maximum deflection may be between about 35 degrees to about 55 degrees from the grip elements 208. However, the flange 210 location corresponding to maximum deflection may be different in other embodiments and, as such, the range of about 35 degrees to about 55 degrees is provided only by way of example. For example, flange 210 locations may be greater, or less than, about 35 degrees to about 55 degrees away from the grip elements 208.

Thus, in still other embodiments, the flanges 210 may be disposed less than 90 degrees, or more than 90 degrees, away from one or more of the sets of grip elements 208. For example, one or more of the flanges 210 may be positioned, relative to a set of grip elements 208, anywhere in a range of about 5 degrees to about 85 degrees away from that set of grip elements. Additionally, or alternatively, one or more of the flanges 210 may be positioned, relative to a set of grip elements 208, anywhere in a range of about 95 degrees to about 175 degrees away from that set of grip elements. The distance between a flange 210 and a set of grip elements 208 may be measured, for example, from the center of the set of grip elements 208 to the flange 210, or from the one of the outermost grip elements 208, in a group of grip elements 208, to the flange 210.

When the closure 200 is locked onto the bottle 100, each of the flanges 210 abuts, or resides near, a corresponding upstanding wall 114 of the bottle 100. More particularly, a portion of the flange 210, such as a face of the flange 210 for example, may contact, or reside near, the face of the upstanding wall 114. Where a flange is angled (see, e.g., FIGS. 19 and 20), a leading edge, or trailing edge, of the flange may contact, or reside near, the face of the upstanding wall 114. In this way, movement of the flange 210 and, thus, movement of the closure 200, is prevented until the flange 210 is deflected to an extent that the upstanding wall 114 no longer interferes with movement of the flange 210, as can may be effected by rotation of the closure 200.

Thus, one consequence of the aforementioned arrangement of the flanges 210 and grip elements 208 is that as the user squeezes the grip elements 208 with adequate effort, the closure 200 is elastically deformed in such a way that the flanges 210 move outwardly, that is, in an x-direction (see reference axes in FIG. 1). More particularly, the lower portion 206 of the closure may be temporarily elastically deformed from its normal circular shape to a non-circular shape, thereby temporarily modifying the position and orientation of the flanges 210, generally in the x-direction, relative to the corresponding lugs 110.

With particular reference to FIG. 10, it can be seen that the flange 210 may be oriented to be generally perpendicular relative to a line drawn tangent to the lower portion 206 of the closure 200 at the location where the flange 210 attaches to the interior of the lower portion 206. This particular orientation of the flange 210 is not required however, as discussed below in connection with FIGS. 16-20, and other orientations of the flange 210, such as about 45 degrees relative to the aforementioned tangent line for example, may be implemented. More generally, in any disclosed embodiment, flange orientations may be implemented that fall anywhere in a range of about 35 degrees to about 125 degrees relative to an imaginary tangent line touching the lower portion at a location where the flange is attached to the lower portion.

Directing attention now to FIGS. 6-7 in particular, further details are provided concerning the example closure 200. In particular, the interior of the closure 200 may include an annular sleeve 211 having an interior set of threads 212 that are generally configured and arranged to interface with the threads 108 of the bottle 100. It will be apparent that the threads 212 may be similar, or identical, to the threads 108. As also indicated in FIGS. 6 and 7, the closure 200 may include an annular lip 214 that is biased towards the uppermost thread 212. As the closure 200 is rotated into engagement with the threads 108 of the bottle 100, the bias of the annular lip 214 is overcome and the threads 108 engage the upper most thread 212 of the closure. Because the annular lip 214 tends to push the threads 108 and 212 together, a fluid-tight seal between the bottle 100 and closure 200 is formed when the closure 200 is locked onto the bottle 100. In some embodiments, a separate sealing element may additionally be provided to provide a fluid-tight seal of the closure 200 to the bottle 100.

With continued reference to FIGS. 5-13, the example closure 200 includes a reservoir 216 collectively defined by a reservoir wall 218 and the upper portion 202. The reservoir 216 defines a volume within which a volume of material, such as liquid detergent for example, may be dispensed from the bottle 100. The interior of the reservoir wall 218 may include indicators 220 extending inwardly from the interior of the reservoir wall 218 and indicating different volumes of fluid, powder, or other material, that may be needed for different amounts/types of laundry, for example. Depending upon the need, fluid, powder or other materials may be poured into the reservoir 218 to the top of one of the indicators 220. The indicators 220 may alternatively take the form of a surface treatment, such as texturing, on the interior of the reservoir wall 218. In some embodiments, the indicators 220 are omitted.

With particular reference to FIG. 7, the closure 200 may be configured to provide an overflow reservoir 222 to catch fluid, such as laundry detergent, that overtops the reservoir wall 218. As shown, the overflow reservoir 222 is annular in its configuration and is cooperatively defined by the reservoir wall 218 and an outer wall 202*a* of the upper portion 202. Because the overflow reservoir 222 is positioned between the reservoir wall 218 and the outer wall 202*a*, any fluid overtopping the reservoir wall 218, or otherwise coming into contact with the reservoir wall 218, will flow down into the overflow reservoir 222 without contacting the

threads **212**. Thus, when the closure **200** is turned right side up (see FIG. **6**), any fluid in the overflow reservoir **222** will flow down the sides of the reservoir wall **218** without contacting the threads **212**. Because the threads **212** remain clean, there is no danger of fluid coming into contact with the threads **108** of the bottle **100**, and then running down the sides of the bottle **100**, when the threads **212** engage the threads **108**. As noted elsewhere herein, some embodiments of a closure may omit the overflow reservoir.

C. Operation of an Example Closure and Bottle

With continued reference to the Figures, when the closure **200** is placed on the bottle **100** and rotated clockwise, the threads **108** and **212** engage each other and the closure **200** moves into a closed position or state. As the closure **200** rotates toward the closed position, the flanges **210** each move up a face **112***a* of a ramp **112**, eventually coming to rest at a position abutting, or near, a respective upstanding wall **114**. This operation may involve some elastic deformation, that is, deflection or bending, of the flanges **210** until the flanges **210** come to a position at which the closure **200** is releasably locked to the bottle **100**. In more detail, when the closure **200** is locked onto the bottle **100**, the flanges **210** are in an undeformed state and are positioned such that the upstanding walls **114** of the lugs **110** interfere with the flanges **210**, that is, the lugs **110** prevent counterclockwise motion of the closure **200** by blocking the flanges **210** from moving.

To unlock the closure **200** from the bottle **100**, the user can grasp the closure **200**, such as at the grip elements **208**, and squeeze the closure **200** to elastically deform the lower portion **206**, and thereby move and/or elastically deform the flanges **210** so that the lugs **110** no longer present an interference to the flanges **210**. Once the flanges **210** have assumed this location and/or state, the closure **200** can then be rotated counterclockwise and removed from the bottle **100**.

D. Further Aspects of Some Example Embodiments

With continued attention to the Figures, following is a discussion of further aspects of example embodiments. It should be understood that none of such aspects are necessarily required to be present in any particular embodiment, and are presented only by way of example.

As best shown in FIGS. **2** and **3**, the lug **110** may have a ramp portion **112** with a compound configuration. That is, the outside edge **112***b*-**1** of the ramp face **112***e* may be offset, in a clockwise sense, from the inside edge **112***b*-**2** of the ramp face **112***e*. Put another way, the outside edge **112***b*-**1** is axially unaligned with the inside edge **112***b*-**2**, such that the beginning and end of the outside edge **112***b*-**1** are positioned ahead, in a clockwise sense, of the beginning and end, respectively, of the inside edge **112***b*-**2**.

With further reference to FIGS. **2** and **3**, the aforementioned offset, combined with leading edge of the lug **110** that is defined by the upstanding wall **114**, results in a generally triangular shape of the upper surface **112***d*, although other shapes of the upper surface **112***d* may be employed, and a triangular shape is not required. The upper surface **112***d*, which may be generally parallel to the surface of the shoulder **104**, may have various other shapes as well however. In some instances, the shape and orientation of the upper surface **112***d* may be necessitated by the offset of the outside edge **112***b*-**1** and inside edge **112***b*-**2** with respect to each other. It will be appreciated that the example lug **110** geometry is relatively more complex than, and thus not intuitive in view of, some of the simple geometries known in the art. Moreover, the lug **110** geometry may enable, or even require, the use of particular flange **210** geometries.

For example, and with reference to FIG. **5** in particular, it can be seen that the flange **210** may, but is not required to, have a generally triangular shape, in which the widest portion of the flange **210** is positioned lower in the closure **200**, given the orientation of the closure **200** in FIG. **5**, than the narrowest part of the flange **210**. In the illustrated example, the innermost edge of the flange **210** may be generally vertical with respect to a y-direction, while the edge of the flange **210** at the interior wall **206***a* is disposed at an angle with respect to the y-direction that generally matches an angle of inclination of the interior wall **206***a*. A triangular, or wedge shaped, configuration of the flange **210** may help to ensure that the flange **210** is able to clear the lug **110** when the flange **210** is rotated radially away from the lug **110** as the user squeezes the closure **200**. It is noted that the flange **210** is not required to have a triangular shape, and any other flange **210** shape that may provide the disclosed functionality may alternatively be employed. For example, a flange such as the flange **210** may have a generally rectangular shape.

In at least some embodiments, the closure **200** and/or bottle **100** do not require any type of frangible element(s) connecting them. As such, disclosed embodiments may be advantageous with respect to known closures that require the use of one or more frangible elements.

In at least some embodiments, one example of which is disclosed in FIG. **6**, the overflow reservoir **222** has an annular configuration and, as such, extends around the entire circumference of the reservoir wall **218**. Advantageously, such a configuration of the overflow reservoir **222** may help to ensure that any overflowing material from the reservoir **216** is captured by the overflow reservoir **222**, regardless of the particular location(s) of the reservoir wall **218** where the overflow occurs.

As noted in the example embodiment of FIG. **7**, a depth of the overflow reservoir **222** may be such that the overflow reservoir **222** does not extend all the way to, or through, the bottom of the upper portion **202**. That is, the floor, or bottom, of the overflow reservoir **222** may not be defined by the bottom of the upper portion **202**. For example, the overflow reservoir **222** may not extend through the bottom (as viewed from the perspective of FIG. **7**) of the upper portion **202** and, instead, the overflow reservoir **222** may have a floor and thus may be able to capture and retain fluid such that the captured fluid does not drain out of the overflow reservoir **222** when the closure is oriented as shown in FIG. **7**. In other embodiments, the overflow reservoir **222** may extend to, or near, the bottom of the upper portion **202**. In at least some embodiments, the overflow reservoir **222** and the reservoir wall **218** are integral with each other and with the other elements of the closure **200** such that the closure **200** is implemented as a single piece of material.

Some example embodiments of the closure **200** and bottle **100** also collectively provide for a spout-less configuration. Rather, as shown in FIGS. **1**-**5**, for example, some embodiments simply provide for a bottle **100** that has a neck **106** that defines a mouth **107**, and a closure **200** that includes a reservoir **216**, such as in the form of a dosing cup. Advantageously, the spout-less configuration eliminates the need to provide a separate, or integrated, spout element as part of the apparatus.

Finally, some example embodiments of an apparatus consist only of the closure **200** and bottle **100**. In contrast

with some known configurations, there is no use or need, in such example embodiments, for an intervening element, such as a spout or other structure for example, part or all of which is positioned between the closure **200** and the bottle **100** when the closure **200** is connected to the bottle **100**. Yet other example embodiments, while they may comprise a closure **200** and/or bottle **100**, do not include intervening elements such as the example spout just noted. Advantageously, embodiments that do not employ or include an intervening element may be relatively simpler to operate, and less expensive to produce, than known configurations that employ one or more intervening elements.

E. Aspects of an Example Alternative Embodiment

With attention finally to FIGS. **16-20**, details are provided concerning an alternative embodiment of a closure, which is designated generally at **300**. Except as may be noted herein, the closure **300** may be similar, or identical, to the closure **200**. Moreover, any aspect or feature of the embodiments of FIGS. **16-20** may be implemented in any of the embodiments of FIGS. **1-15**, and vice versa. As such, the following discussion is generally directed to selected differences between the closure **300** and the closure **200**. Notably, the closure **300** does not include an overflow reservoir.

As shown, the closure **300** may comprise an upper portion **302** and lower portion **304**. The upper portion **302** may include one or more upper grip elements **306**, which may be arranged in one or more groups, or may be distributed uniformly about the circumference of the upper portion **302**. As well, the lower portion **304** may include one or more lower grip elements **308**, which may be arranged in one or more groups, or may be distributed uniformly about the circumference of the lower portion **304**. In one or more embodiments, the lower grip elements **308** may form two groups that are disposed about 180 degrees apart from each other. In other embodiments, more, or fewer, groups of lower grip elements **308** may be employed, and the groupings of lower grip elements **308** may be provided that are disposed at different positions relative to each other. For example, three groups of lower grip elements **308** may be provided that are disposed about 120 degrees apart from each other. The scope of the invention is not limited to any particular number or arrangement of lower grip elements **308**, or upper grip elements **306**.

In one embodiment, the outside diameter at, or near, the top of the upper portion **302** may be about 38.49 mm without taking into account the upper grip elements **306**. When the upper grip elements **306** are taken into consideration, the outside diameter at, or near, the top of the upper portion **302** may be about 39.96 mm. These dimensions are provided only by way of example, and are not intended to limit the scope of the invention. Larger, and smaller, outside diameters of the top of the upper portion **302** may be employed in other embodiments.

With particular reference to FIGS. **19** and **20**, one or more flanges **310** may be provided that are configured to interface with corresponding structures of a bottle, such as the bottle **100** discussed above in connection with the closure **200**. The principles of the interaction of the flanges **310** with the bottle **100** may be the same as described in the discussion of the closure **200**, although one or more of the flanges **310** may have an orientation and/or configuration that is different from the orientation and/or configuration of the flanges **210**.

As best shown in FIG. **20**, one or more of the flanges **310** may have a generally triangular shape, although no particular shape or configuration of the flanges **310** is required. As well, and shown in FIG. **19**, one or more of the flanges **310** may be oriented to be non-perpendicular relative to a line drawn tangent to the lower portion **306** at the location where the flange **310** attaches to the interior of the lower portion **306**. For example, in one embodiment, one or more of the flanges **310** may be disposed at an angle β of about 45 degrees relative to a line drawn tangent to the lower portion **306** at the location where the flange **310** attaches to the interior of the lower portion **306**. Such non-perpendicular orientations of one or more of the flanges **310** may help to strengthen the flange **310** so that the flange **310** is less likely to smear, or break, during use. Angles β of other than 45 degrees may be employed. For example, any angle β between about 0 degrees and about 90 degrees, relative to the tangent line, may be used for the orientation of a flange **310**.

Thus, a flange **310** may be located and oriented in such a way that the flange **310**, in cooperation with a lug **110** and/or other structure of a bottle such as the bottle **100**, tends to resist removal of the closure **300** from a bottle **100**, but the flange **310** provides no material impediment to attachment of the closure **300** to a bottle **100**, as shown by the 'tighten' and 'loosen' notation in FIGS. **19** and **20**. That is, it can be seen from those Figures that the flanges **310** may, as a consequence of their location and/or orientation, be able to move readily past corresponding structure of a bottle **100** when the closure **300** is being tightened on the bottle **100**, but the flanges **310** may likewise tend to resist, or completely prevent, loosening of the closure **300** relative to the corresponding structure of the bottle **100** unless, or until, the user squeezes the lower grip elements **308** so as to elastically reposition the flanges **310** relative to the corresponding structure of the bottle **100**.

As further indicated in FIGS. **19** and **20**, one or more of the flanges **310** may be located relatively near to a respective group of lower grip elements **308**, although that is not necessarily required. As a result, when the user squeezes the lower grip elements **308**, that squeezing motion may act to elastically reposition the nearby flanges **310** so that the closure **300** can be removed. This configuration and arrangement of the flanges **310** relative to corresponding structure of a bottle **100** may be referred to as a ratchet and/or as implementing a ratchet effect since, absent any efficacious squeezing of the lower grip elements **308** by a user, the closure **300** can only be tightened on the bottle **100**, but not loosened.

F. Further Example Embodiments

Following are some further example embodiments of the invention. These are presented only by way of example and are not intended to limit the scope of the invention in any way.

Embodiment 1. A closure, comprising: an upper portion; a lower portion attached to the upper portion and including a flange extending inwardly from an interior wall of the lower portion, and the flange resides entirely within the lower portion; a plurality of grip elements located on an outer surface of the lower portion; and an annular sleeve disposed in the lower portion and including a set of interior threads.

Embodiment 2. The closure as recited in embodiment 1, wherein the closure comprises a reservoir defined in part by a reservoir wall and extending from the upper portion through the lower portion, and wherein the reservoir wall

and an inner wall of the upper portion cooperate to define an annular overflow reservoir configured to capture and retain overflow from the reservoir.

Embodiment 3. The closure as recited in embodiment 2, wherein the overflow reservoir is radially positioned between the threads and the reservoir wall.

Embodiment 4. The closure as recited in any of embodiments 1-3, further comprising an annular lip disposed within the annular sleeve and biased towards the interior threads.

Embodiment 5. The closure as recited in any of embodiments 1-4, wherein in a first operational state, the flange is in a first position, and in a second operational state, the flange is in a second position that is different from the first position.

Embodiment 6. The closure as recited in any of embodiments 1-5, wherein in a first operational state, the flange is in a deformed and/or deflected state, and in a second operational state, the flange is in an undeformed and/or undeflected state.

Embodiment 7. The closure as recited in any of embodiments 1-6, wherein the flange is located anywhere in a range of about 35 degrees to about 55 degrees apart from the plurality of grip elements.

Embodiment 8. A bottle, comprising: one or more walls and a bottom connected with the walls, the bottom and the walls defining a volume; a neck connected with the one or more walls and including a set of exterior threads; a shoulder connecting the one or more walls to the neck; and a lug disposed on the shoulder and including a ramp portion and an upstanding wall, and the ramp portion has a compound configuration in which an inside edge of the ramp portion is offset, in a clockwise respect, from an outside edge of the ramp portion.

Embodiment 9. The bottle as recited in embodiment 8, wherein the upstanding wall is about perpendicular to the shoulder.

Embodiment 10. The bottle as recited in any of embodiments 8-9, wherein the ramp portion is configured so that a high end of the ramp portion is located a distance clockwise from a low end of the ramp.

Embodiment 11. The bottle as recited in any of embodiments 8-10, wherein the lug includes an upper surface that is about parallel to the shoulder.

Embodiment 12. The bottle as recited in any of embodiments 8-11, wherein the lug includes an outside upstanding wall that is about perpendicular to the shoulder and abuts the upstanding wall.

Embodiment 13. The bottle as recited in any of embodiments 8-12, further comprising a second lug disposed about 90 degrees apart from the lug.

Embodiment 14. The bottle as recited in any of embodiments 8-13, wherein the lug includes an upper surface that is about parallel to the shoulder.

Embodiment 15. An apparatus, comprising: a bottle, comprising: one or more walls and a bottom connected with the walls, the bottom and the walls defining a volume; a neck connected with the one or more walls and including a set of exterior threads; a shoulder connecting the one or more walls to the neck; and a lug disposed on the shoulder and including a ramp portion and an upstanding wall, and the ramp portion has a compound configuration in which an inside edge of the ramp portion is offset, in a clockwise respect, from an outside edge of the ramp portion; and, a closure that is releasably connectible to the bottle, the closure comprising: a lower portion including a flange extending inwardly from an interior wall of the lower portion, and the flange resides entirely within the lower portion; and an annular sleeve disposed in the lower portion and including a set of interior threads.

Embodiment 16. The apparatus as recited in embodiment 15, wherein the lower portion comprises a plurality of grip elements located on an outer surface of the lower portion.

Embodiment 17. The apparatus as recited in any of embodiments 15-16, wherein the closure comprises an upper portion connected to the lower portion, and the upper portion comprises a plurality of grip elements.

Embodiment 18. The apparatus as recited in any of embodiments 15-17, further comprising a reservoir defined in part by a reservoir wall and extending from the upper portion through the lower portion, wherein the reservoir wall and an inner wall of the upper portion cooperate to define an annular overflow reservoir configured to capture and retain overflow from the reservoir.

Embodiment 19. The apparatus as recited in embodiment 18, wherein the overflow reservoir is radially positioned between the threads of the closure and the reservoir wall.

Embodiment 20. The apparatus as recited in any of embodiments 15-19, wherein the flange is disposed at an angle in a range of about 35 degrees to about 125 degrees relative to an imaginary tangent line touching the lower portion at a location where the flange is attached to the lower portion.

The present invention may be embodied in other specific forms without departing from its spirit or essential characteristics. The described embodiments are to be considered in all respects only as illustrative and not restrictive. All changes which come within the meaning and range of equivalency of the claims are to be embraced within their scope.

What is claimed:

1. An apparatus, comprising:

a bottle, comprising:

one or more walls and a bottom connected with the walls, the bottom and the walls defining a volume;

a neck connected with the one or more walls and including a set of exterior threads;

a shoulder connecting the one or more walls to the neck; and

a lug disposed on the shoulder and including a ramp portion and an upstanding wall, and the ramp portion has a compound configuration in which an inside edge of the ramp portion is axially unaligned with an outside edge of the ramp portion; and,

a closure that is releasably connectible to the bottle, the closure comprising:

a lower portion including a flange extending inwardly from an interior wall of the lower portion, and the flange resides entirely within the lower portion; and

an annular sleeve disposed in the lower portion and including a set of interior threads.

2. The apparatus as recited in claim **1**, further comprising an annular lip disposed within the annular sleeve and biased towards the set of interior threads.

3. The apparatus as recited in claim **1**, wherein in a first operational state, the flange is in a first position, and in a second operational state, the flange is in a second position that is different from the first position.

4. The apparatus as recited in claim **1**, wherein in a first operational state, the flange is in a deformed and/or deflected state, and in a second operational state, the flange is in an undeformed and/or undeflected state.

5. The apparatus as recited in claim **1**, wherein the lower portion comprises a plurality of grip elements located on an outer surface of the lower portion.

6. The apparatus as recited in claim 1, wherein the upstanding wall is about perpendicular to the shoulder.

7. The apparatus as recited in claim 1, wherein the ramp portion is configured so that a high end of the ramp portion is located a distance clockwise from a low end of the ramp portion.

8. The apparatus as recited in claim 1, wherein the lug includes an upper surface that is about parallel to the shoulder.

9. The apparatus as recited in claim 1, wherein the lug includes an outside upstanding wall that is about perpendicular to the shoulder and abuts the upstanding wall.

10. The apparatus as recited in claim 1, further comprising a second lug disposed about 90 degrees apart from the lug.

11. The apparatus as recited in claim 5, wherein the lug includes an upper surface that is about parallel to the shoulder.

12. The apparatus as recited in claim 5, wherein the flange is located anywhere in a range of about 35 degrees to about 55 degrees apart from the plurality of grip elements.

13. The apparatus as recited in claim 1, wherein the closure comprises an upper portion connected to the lower portion, and the upper portion comprises a plurality of grip elements.

14. The apparatus as recited in claim 13, further comprising a reservoir defined in part by a reservoir wall and extending from the upper portion through the lower portion, wherein the reservoir wall and an inner wall of the upper portion cooperate to define an annular overflow reservoir configured to capture and retain overflow from the reservoir.

15. The apparatus as recited in claim 14, wherein the overflow reservoir is radially positioned between the set of interior threads of the closure and the reservoir wall.

16. The apparatus as recited in claim 1, wherein the flange is disposed at an angle in a range of about 35 degrees to about 125 degrees relative to an imaginary tangent line touching the lower portion at a location where the flange is attached to the lower portion.

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